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ELECTRICAL REVIEW

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4 MARCH 1955

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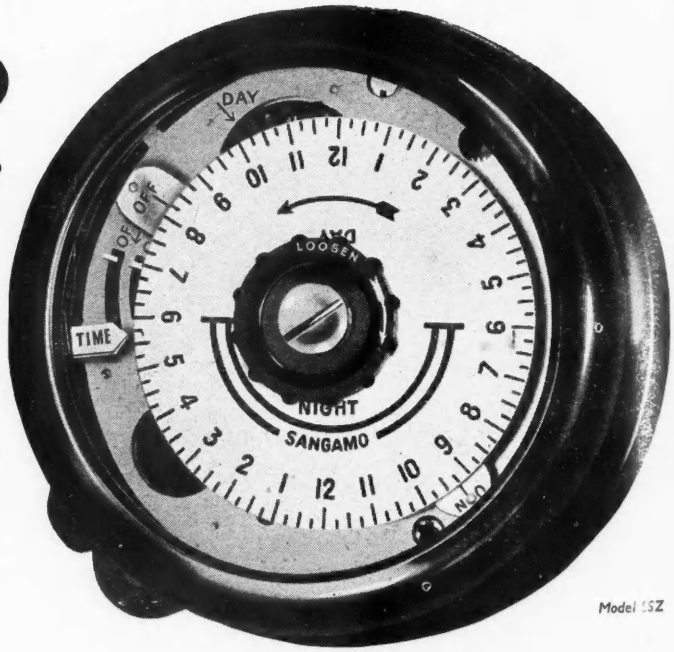

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ELECTRICAL REVIEW

4 March 1955 Vol. 156 No. 9 Established 1872

London Transport

WE gather from the report of the Committee of Inquiry into London Transport that if the system falls short of perfection it is not because the London Transport Executive and its staff are inefficient but because they are the victims of circumstances which they themselves are powerless to alter. The Committee appears to approve most of the policies of the Executive even though it has presumably had the views of opponents of these policies placed before it. For instance in the matter of the replacement of trolley-buses by oil-engined buses the Committee considers that London Transport has taken questions of economy and efficiency fully into account and that its method of handling this difficult problem was " up to the highest standards in industry." It may be flogging a dead horse to remark that there are other factors than economy and efficiency which should have had consideration, such as passengers' comfort and convenience—and indeed preference. With proper care for these, efficiency and economy (and solvency) would be achieved automatically.

Likewise the Executive's abandonment of tramways is fully accepted largely on the score of relieving narrow congested streets. The reason is only partly valid, for in the outer areas, in which the trams largely operated, the streets were sufficiently wide to accommodate them. There were good arguments in their favour and better ones for substituting trolley-buses if it were thought imperative that the trams should go. We need only refer to the cleanliness and operating smoothness of the trolley-bus, reducing atmospheric pollution and improving travelling conditions.

The Committee agrees with the London Transport Executive that the proposed new tube railway (" Route C ") would be unremunerative but it points out that the line would have such beneficial effect upon traffic on other lines and in central London generally that the work would be justifiable. It is hinted that the financing of the line might be helped by other authorities who would benefit from its operation.

In the meantime Mr. H. Molson, Parliamentary Secretary to the Ministry of Transport, has given his Ministry's view to the House of Commons. He said that there was no question about the desirability of the new tube for traffic but it could not be undertaken without " fortifying " the Executive's finances. That was why neither the Government nor the British Transport Commission could make a firm decision whether to proceed with the tube or not. In these circumstances it seems to us that the Government should regard the work in the light of London traffic conditions as a whole and, if necessary, " fortify " London Transport's finances from other sources.

HIRE-PURCHASE CONTROL

It was expected that the removal of hire-purchase restrictions a few months ago would mean increased business but the actual extent of this increase has taken the Government by surprise. This has been one of the factors in the recent fall in the external value of sterling which the Chancellor of the Exchequer has set out to correct. By raising the bank rate and re-imposing restrictions on hire-purchase he hopes to redress the balance. While his decisions are not welcome they must be recognized as necessary, although perhaps the details of the new Order may be criticized. The distinction between useful and " luxury " goods is a rough one. From the particulars given in this issue it will be seen that cameras, jewellery and television sets, for instance, are lumped together with washing machines, vacuum cleaners, electric kettles and refrigerators in the " short-period " class, and in the " long-period " class there is a discrimination in favour of gas-heated washing machines. It must be said, however, that cookers and water heaters receive favourable treatment. On the whole the restrictions are only half as severe as those existing before last July and so their effect will be retarding, not prohibitive.

DISTRIBUTION WEAKNESSES

Generating plant capacity is now adequate to meet any but abnormal demands and conditions this winter have been kind to the British Electricity Authority. But there are still frequent local breakdowns caused by the overloading of the Electricity Board's distribution systems. These naturally cause annoyance (as well as inconvenience) to consumers who have read comforting statements in the newspapers about the power plant situation. When complaints are made it is not very politic to attribute the trouble to the consumers themselves, as one Board is reported to have done recently. It is true that the wholesale connection of new appliances without notification sometimes makes the Board's work very difficult, but to give this as a reason for breakdowns invites the retort that the Boards are actively encouraging the purchase of these appliances. Undoubtedly the distribution networks in many districts need reinforcement.

ELECTRICITY IN THE NAVY

The electrical engineer has an immense responsibility in a modern naval vessel, especially one of the complexity of a large aircraft carrier. This responsibility is one which has grown yearly: its magnitude and specialist nature were somewhat tardily recognized by the Board of Admiralty when they established the " L " branch in 1946. It was therefore with keen interest that we inspected some of the electrical arrangements in H.M.S. *Ark Royal* last week. An idea of their scope is given by the figure of 150 or so on the staff of the Commander (L) out of a ship's complement of 1,800. This branch is responsible not only for the electrical generation and distribution but also for radio, radar, telephones and the multifarious electrically-driven apparatus. In few branches of the profession is one man so closely responsible for such widely divergent equipment. For promotion to the senior ranks engineers of the highest calibre are needed; their peacetime role is arduous and under emergency conditions one of increasing importance.

B.I.F. ELECTRICAL SECTION

We hear that the organizers of the London and Birmingham Sections of the British Industries Fair propose to take a referendum among electrical firms asking whether they favour London or Birmingham as the place for the Electrical Section. Our own views on this subject are already known to our readers; they were last set out in the leading article of the *Electrical Review* of 10th December, 1954. We may repeat that an export exhibition without proper representation of the country's second largest exporting industry is inconceivable. Whether it be in London or at Birmingham there must be an Electrical Section; where it is to be placed is for the exhibitors and potential exhibitors to say. Whatever the majority decides it is to be hoped that the rest will accept so that the Electrical Section will be more fully representative than it is this year.

HIGH VOLTAGE TRANSMISSION

Nearly three years' experience of transmission at 400-380 kV in Sweden appears to have fully justified the boldness of the scheme. While the stimulus of international competition has no doubt been of value in encouraging the adoption of advanced designs, it was a pressing need that led to the adoption of a hitherto untried voltage, as Mr. Ake Rusck made clear in his lecture to the Institution of Electrical Engineers, which forms the subject of an article in this issue. The possible use of d.c. was considered, but its present early stage of development ruled it out for mainland long distance transmission. Nevertheless the successful use of 50 kV ionic valve sets, similar in principle to normal mercury-arc rectifiers, for submarine transmission to Gotland indicates the progress that is being made, since 3 kV was formerly the limit.

ELECTRICAL INVESTMENT

Writing to the *Economist* on the capitalization of nationalized industries Mr. Eric Macfadyen says:—

> " Electricity is an example of an industry which the Treasury guarantee has assisted to achieve a disproportionately rapid rate of capital formation since the war. In consequence, resources which would have been better applied to the re-equipment of industry have been utilized to foster consumption—an unwise policy for an economy dependent on competitive world trade."

It is true that the Treasury guarantee has enabled the British Electricity Authority to raise capital at very favourable rates but it is hardly likely that the Treasury will ever be called upon to take up its guarantee. But it is not true that resources have been utilized to foster consumption in the sense implied—wasteful consumption. In fact electrical development has been very largely in the direction of the re-equipment of industry (until fairly recently domestic electrical expansion has been restricted) and this has been all-important in an economy dependent on competitive world trade. Industrial investment without parallel or precedent electrical investment would be an absurdity.

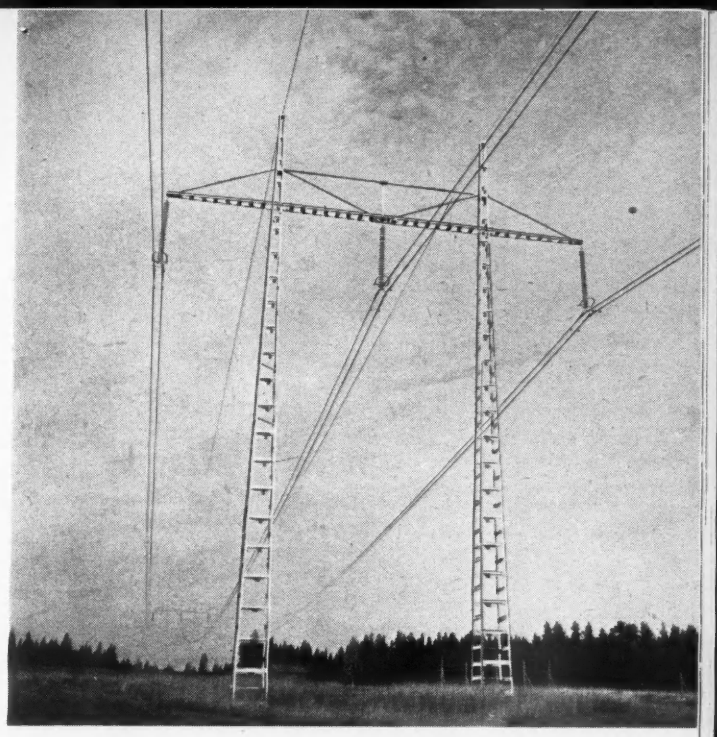
Transmission Developments in Sweden

High Voltage A.C. and D.C. Systems

EXPERIENCE of the 400-380 kV three-phase Swedish mainland transmission system and of the 100 kV d.c. submarine connection to Gotland in the Baltic and their possible future development formed the subject of a lecture delivered by Mr. Ake Rusck (chairman, Swedish State Power Board) to the Institution of Electrical Engineers on 23rd February.

As a background to the present position he discussed the reasons that have necessitated the adoption of high transmission voltages there, beginning with 10 kV to cover seven miles in 1893—one of the first transmission systems in the world—and the progressive raising of the voltage to 220 kV in 1936.

From north to south the distance is 1,000 miles, 60 per cent longer than in Great Britain, but the population density is only 7 per sq mile compared with 80 here. Coal and oil resources are lacking, but hydro resources have a potentiality of 80,000 million kWh/annum, of which the 24,000 million now produced corresponds to 3,300 kWh/head, about equal to the U.S.A., but less than in Norway and Canada. About 85 per cent of the people live in the south, where there is only 15 per cent of the potential water power, so electrical energy has to be sent over distances of 300 to 1,000 miles.

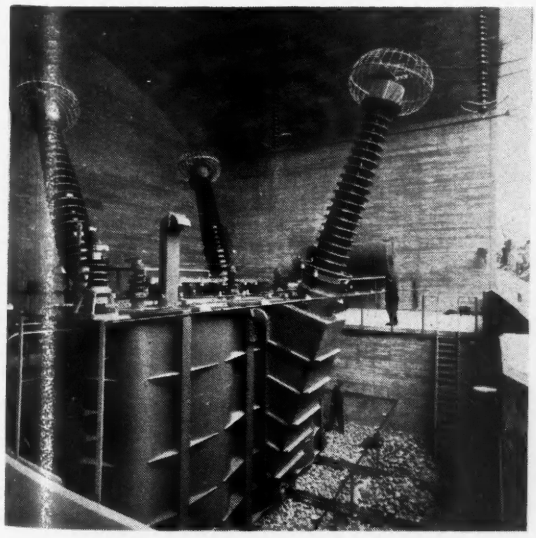


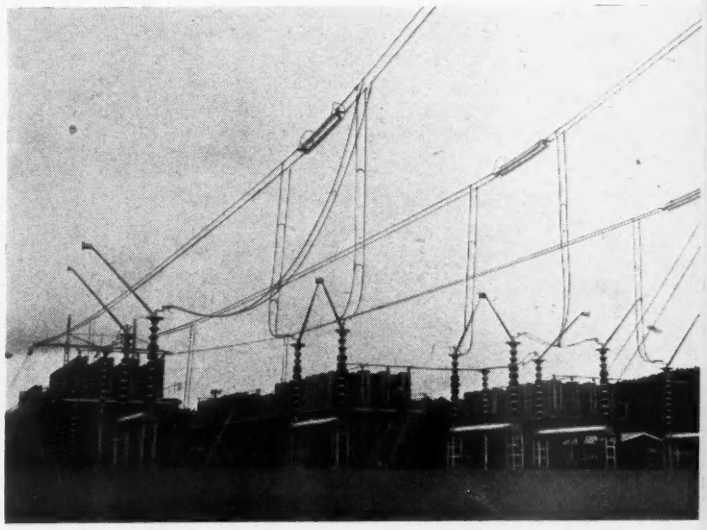
Tower for the second 380 kV line now under construction

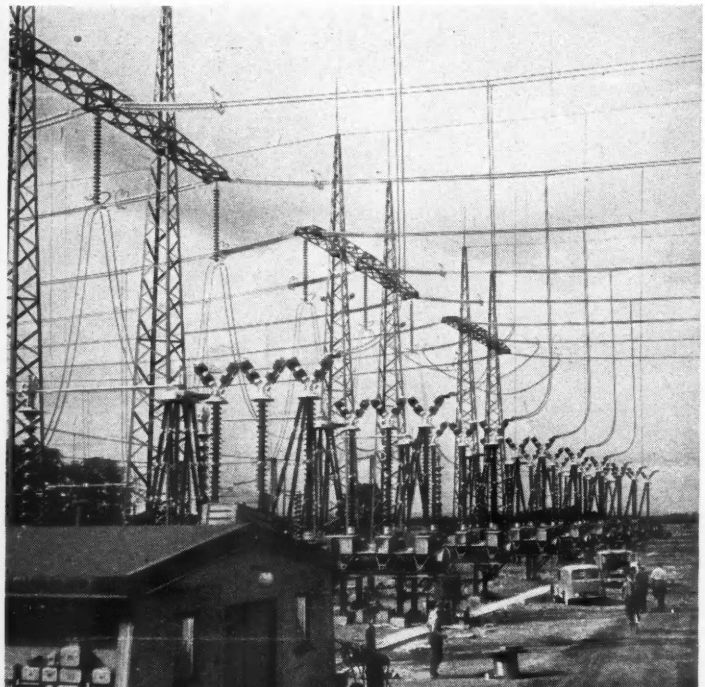
The State Power Board (an independent business enterprise) owns the 380 kV and most of the 220 kV networks, all of which it operates, and it is responsible for 40 per cent of power production; the remainder is provided by a number of smaller municipalities and companies, which run their plants voluntarily in parallel with those of the Board. In 1946 the north-south transmission comprised four 220 kV lines with two further ones under construction. It appeared that a new 300 mile line at that voltage would be required every year, which would have involved rights of way difficulties.

The need for a higher voltage became more apparent when the harnessing of Harspranget Falls in the Arctic Circle, 600 miles from the centre of consumption, was decided upon in 1946. The 380 kV scheme was then put in hand and the first line was in operation at 220 kV

Three-phase transformer, 100 MVA at 380 kV and (right) the 380 kV series capacitor plant at Djurmo







Air-blast circuit breaker, 380 kV

early in 1951 to relieve the situation with the aid of the first 220 kV series capacitor.

Fundamental data having been settled, the A.S.E.A. started to manufacture the transformers, circuit breakers and most of the other electrical equipment. The insulation level was fixed at 1,600 kV for the first two 380 kV lines, but reduced to 1,500 for lines put into service last year, except for circuit breakers and measuring transformers. A special grading ring was developed to reduce the voltage stress across the bottom units. To minimize corona losses and interference with radio, double conductors of steel-aluminium, 1¼in in diameter, with 18in spacing between them were adopted for each phase; this formation reduced line reactance by 26 per cent and increased line stability; no mechanical trouble under severe ice loading has been experienced.

Gains would be greater with three or four bundled conductors per phase, but not enough to compensate for their higher cost and constructional complications. A third conductor may later be added to reduce ohmic losses if series capacitor compensation is used.

Lines at present under construction are supported on bolted instead of welded towers as used for the earlier lines. The standard span is 1,080ft and the crossarm height 75ft with 39ft spacing between phases. Spacers are placed between each pair of phase conductors at a maximum distance of 430ft. Next year a third 380 kV line from the north is expected to be working, bringing the total length to 1,900 miles. A fourth line is under consideration for operation in 1960.

Two series capacitors, introduced in the first 380 kV line in 1954, gave compensation corresponding to 44 per cent of the line reactance, raising the stability-limit loading from 450 to 700 MW. In the second line a 30 per cent series capacitor is to be inserted this year. Each capacitor station is rated at 100 MVA.

Double-wound step-up and auto-connected step-down single-phase transformers have been installed at all stations except Midskog (in the centre of the first 380 kV line). The first groups (380-220 kV) were rated at 300 MVA, but those installed in 1954 are 510 MVA units for 380/130 kV—the largest ever built. A new power station contains two three-phase 100 MVA, 380 kV transformers. Most transformers are underground and connected to outdoor switchgear through 380 kV cables, which in the newer installations are taken directly from the transformers without bushings.

Circuit breakers for the first line were of the A.S.E.A. air-blast type rated at 8,000 MVA, but later oil-minimum and air-blast units of other makes have also been used. A rupturing capacity of 12,000 MVA is now specified. Overall time for relay protection on air-blast breakers is about 0·10 sec and over-voltages are less than 2·5 times the voltage to earth prior to interruption. Automatic high-speed reclosing has functioned well so far.

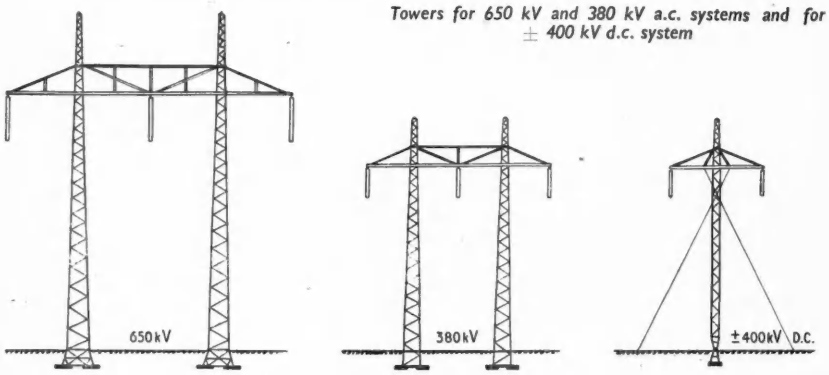
Voltage and power factor are controlled by reactors and synchronous condensers. Corona losses average 2 MW in a line of 300 miles. Radio interference does not affect receivers at more than 100 to 300ft from the overhead lines, which are used as antennæ for the national broadcasting programme.

Lines are designed to carry a superimposed load on each conductor of 2¾ lb/ft. Ice has been removed from working conductors by sweeping them with polythene ropes. Up to now there have been five single-phase and two two-phase breakdowns due to lightning, i.e. 0·25 faults per 100 miles per annum. All were correctly cleared and in several cases the lines were automatically reclosed.

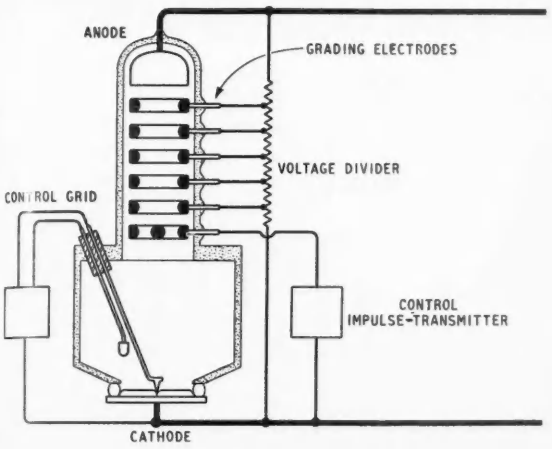
By introducing the 380 kV system and series capacitors, transmission cost per kW, including losses, has been lowered by 40 per cent compared with 220 kV standards.

If present knowledge had been available when the adoption of 380 kV was decided, probably 450 kV

Towers for 650 kV and 380 kV a.c. systems and for ± 400 kV d.c. system



	650 kV	380 kV	±400 kV D.C.
Phase distance	56ft	39ft	36ft
Height to crossarm	102ft	75ft	73ft
Length of isolator string	21½ft	14ft	12ft



High voltage ionic valve (50 kV)

would have been chosen. The insulation level of the present 380 kV system is somewhat conservative and would allow an increase of voltage to 500 kV when internal over-voltages have been reduced. If that is done a third conductor would be added to each phase bundle to avoid radio interference. Transformers would be rewound or associated with booster transformers; this would be easier in the north, where double windings are used to step up the generating voltage, than in the south, where auto-transformers are usually installed. One solution would be to allow 450 kV at the transmitting end to drop gradually to 400 kV at the receiving end. The possible use of 650 kV with four bundled conductors is under investigation. Such a line would transmit 2,000 MW with series capacitor compensation. Together with the four 380 kV lines, two or three 650 kV lines in 1960 would provide for all future power transmission in Sweden.

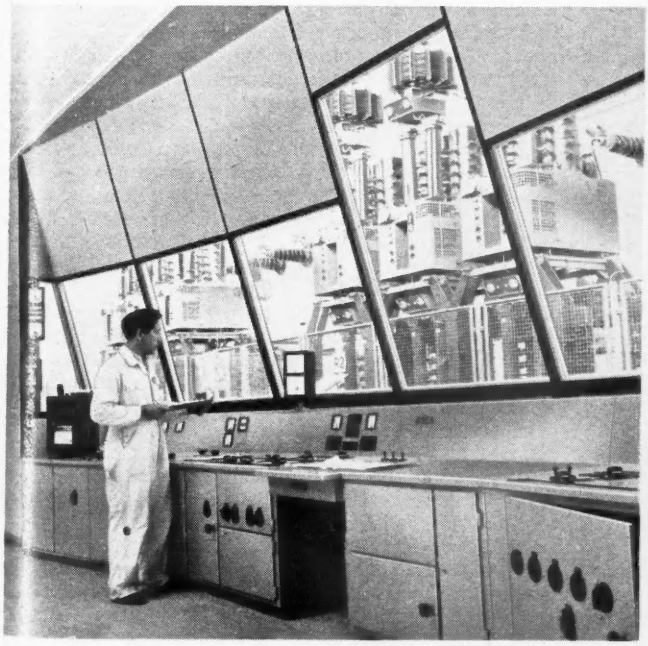
An alternative under consideration is a d.c. system at ± 400 kV which would carry nearly 2,000 MW. The need for the 650 a.c. or ± 400 kV d.c. systems is at present doubtful. Although reassessment of the hydro resources in the north indicate that these are about twice as much as originally estimated, transmitting capability of the 380 kV lines has been increased by the use of series capacitors and the load in the northern districts is growing. Moreover within ten to twenty years nuclear power plants may deal with some of the load in the south.

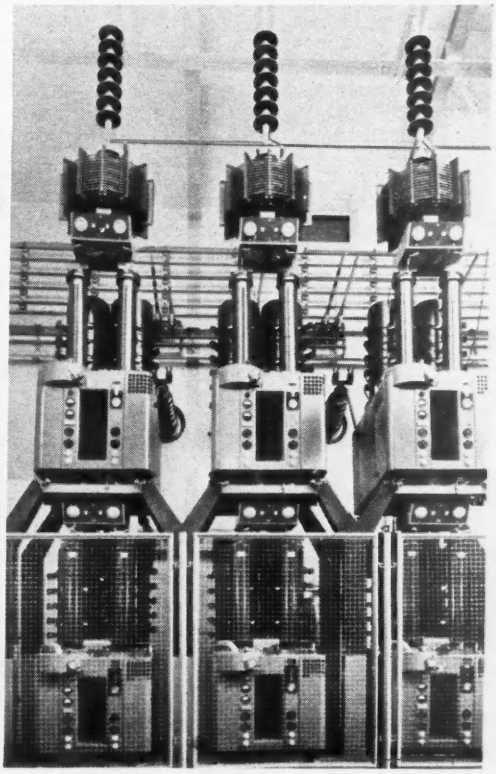
Research undertaken since 1945 into the economic potentialities of high-voltage d.c. has been applied to a 60-mile connection at 100 kV between the mainland and the Baltic island of Gotland—too far for a.c. cable transmission. Power is supplied from the 132 kV network at Vastervik where the voltage is transformed to 40 kV feeding two series-connected 10 MVA " valve " sets having a d.c. output of 50 kV. The current is reconverted to a.c. at Visby to serve the island's 33 kV distribution system.

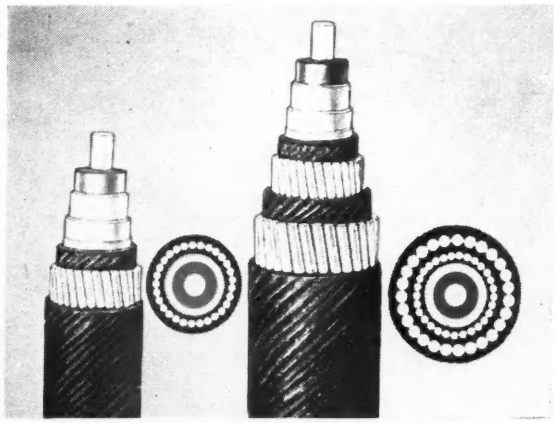
Each convertor comprises seven ionic valves, one being spare. Failure of a valve to block the current flow in one direction occasions a partial short circuit on the connected network. In that case the six operating valves are blocked through their control grids, whereupon the seventh valve opens a parallel path for the current, which cuts off the supply to the main group automatically enabling it to function again. The whole procedure takes less than 0·5 sec, and its effects are imperceptible.

The submarine cable has a single 0·17 sq in conductor, the return being by earth and water via two electrode stations, which are situated six miles away to avoid risk of corrosion of the armouring and lead sheath. Insulation consists of a 7 mm thick layer of heavy-oil-impregnated paper, over which are placed two lead sheaths, wire

Control room of the Gotland d.c./a.c. station and (right) mercury arc valves for convertor stations







Cross-section of 100 kV d.c. cable to Gotland

armouring (double near the shore) and a jute covering.

The cable was laid in sixteen days in May and June, 1953, by the British Post Office ship *Alert*. It was in two lengths (only one joint having to be laid at sea) weighing 300 to 600 tons. The convertors at both ends are controlled from Visby by a radio link. Energy transmitted to Visby is regulated automatically to correspond with consumption by the a.c. frequency on the Gotland network. The direction of transmission has sometimes been reversed and steam power from Gotland has relieved the situation on the mainland during water shortages.

Test operation started on 7th March, 1954. After two weeks a cable fault occurred, due to mechanical damage (probably in manufacture or in laying), which owing to unfavourable weather required three weeks to repair. A second fault in October, caused by a ship's anchor (to avoid which in future precautions are being devised), took seven days to rectify. Neither fault is considered serious. The convertors have operated most satisfactorily and no trouble with commutation has been experienced.

The cost of the d.c. system amounted to £1·3 million £0·35 million was spent on the cable), equivalent to £65/kW of the 20 MVA transmission capacity. The figure could now be reduced to £21/kW if 100 MW at 200 kV were transmitted. If the distance were equal to that between England and France the cost would be reduced to £18/kW.

Electrical Manufacturing

Its Part in the Country's Economy

AT the Institution of Electrical Engineers last evening there was presented a paper by Mr. G. L. E. Metz on "The Electrical Engineering Industry in the Post-War Economy." In a previous paper (1946) Mr. Metz (with Mr. R. L. Davies) outlined some of the economic problems facing the country and the electrical industry's share of the responsibilities for dealing with them (*Electrical Review*, 8th and 15th March, 1946). Since then Institution presidential addresses have endorsed the authors' suggestion that periodically there should be a review of the position and achievement.

Seventy years ago Great Britain was the leading industrial nation but great changes have taken place which have made things difficult for this country. Our output per man-year is no longer the greatest, other nations are striving to achieve self-sufficiency and our imports of materials are greater than our exports of finished goods.

Although we are still living within our means the future is uncertain and will remain so until we build up adequate reserves by producing and exporting more and sending a greater proportion to non-sterling countries. The electrical industry, together with electricity supply, is generally regarded as one of the keys to greater and more efficient production in other exporting industries.

Progress in the production, exports and employment of the electrical industry has been satisfactory but still the achievements have fallen short of the aims. It is necessary to consider whether the industry can do more to help other industries to increase production and exports.

The author considers that the increase in production per man-year has been very modest for an industry in which there has been considerable capital investment, which includes some of the most efficient plants in the world and to which other industries look for help in solving their own productivity problems. The great resources expended on the industry have been used largely in order to provide easier conditions for employees and to reduce working hours instead of expanding the volume of products.

It is by no means certain that if British workers had as much capital equipment and power available to them as American workers productivity would rise as rapidly here as it has risen in the United States. Before any great improvement can occur it seems that there must be a greater willingness to use new methods and labour-saving devices effectively and a determination to act as a team rather than as isolated groups of individuals not wholly sympathetic one with another.

Regarding world trade, Mr. Metz says that the problem is not merely one of making more things more cheaply, producing two things for every one made before or taking a larger share of world markets. There are certain other vital balances which determine the optimum level of trade, production and price and deserve more attention than they have received so far.

This leads to a study of research, annual expenditure on which is stated to be about £200 million (12½ per cent contributed by industry) in Great Britain and about £1,000 million (nearly a half from industry) in the United States. The author puts the corresponding expenditure on research and development by the electrical industry as £5·4 million here and £70 million in the United States. He suggests that it would be wise to concentrate research on the development of new and improved labour-saving devices for the home and factory at prices which people can afford. There must be a search for new ways to absorb labour made redundant by the increasing "automation" of factories.

Having regard to the amount and cost of imported materials used in electrical manufacture the author

considers that electrical exports, important as they are, do not help quite so much in the balance-of-payments problem as the published figures might suggest. One contribution to the solution of the problem is the elimination of waste of all imported materials, particularly copper, cotton and rubber, and this should rank high in research programmes.

The pattern of export trade is examined and the conclusion is reached that if the electrical industry is to find an outlet for a large and rapid increase in exports it will have to look to European and other than Commonwealth countries which together account for over half the world trade in electrical goods.

In his conclusions Mr. Metz says that the electrical manufacturing industry would seem to have a future in which even the spectacular advances of the last twenty years will be dwarfed. It also has responsibilities in many ways greater than it has had to face before. He believes that those in the industry will discharge these responsibilities, but he does not think that they will realize all the possibilities open to them without a clear objective to give purpose and direction to their efforts.

London Transport Inquiry

Committee's Recommendations

IN July, 1953, the Minister of Transport appointed a Committee of Inquiry under the chairmanship of Mr. S. P. Chambers, C.B., C.I.E., to inquire into the London Transport undertaking with a view to ascertaining what measures could be taken by those responsible to secure greater efficiency or economy.

The Committee's report was published last week.* Much of it is devoted to traffic conditions and London Transport's methods of dealing with them and the Committee's recommendations relate largely to possibilities of more economical operation.

Although the Committee received representations criticizing the Executive for deciding to abandon trams, it is satisfied that the decision was right; "whatever the merits of railed electric traction in some Continental cities with wide streets such a system is clearly obsolete and impracticable for London." Similarly the Committee approves the Executive's policy of replacing electric trolley-buses by oil-engined vehicles.

Reference is made to the introduction of cars of improved design and fabricated largely in light alloy on the Underground railways. This, and the use of improved regenerative braking, is regarded as sound and should be pressed forward.

Dealing with the proposed new tube railway to link up the northern railway termini ("Route C"), the Committee says that London Transport in written evidence agrees that such a line would attract some extra traffic, provide more comfortable services and relieve congestion, but suggests that the increased receipts would not warrant the heavy capital expenditure needed. Nevertheless the Committee thinks that a project of this kind should not be abandoned or postponed because on the basis of direct revenue and expenditure it appears to be unprofitable. In this case the direct financial results might be more favourable than appears likely at the present time. It is noted that the new Toronto Subway, opened last year, is already showing a profit, although a loss was forecast.

If road traffic congestion problems can be solved by carrying passengers underground the indirect economic advantages of such a railway as "Route C" might well make up the difference between the additional receipts earned by the new railway and the full return on the capital expended on it. As these advantages would be shared by road authorities the whole subject of financing such a railway will require careful consideration.

London Transport has declared that the carrying out of improvements at some Central London Underground stations to relieve rush-hour congestion would be expensive and unremunerative. The Committee sympathizes with this view and considers that before heavy expenditure is incurred vigorous action should be taken to persuade the larger employers, including Government Departments, to join in a campaign for staggering working hours.

The Committee is in favour of charging depreciation on railway rolling stock on the basis of present-day replacement costs, although this would double the amount set aside for the purpose.

At present there is no general manager for each of the separate London Transport services. Co-ordination of functions takes place only at the level of the Executive itself. A reorganization should be considered which would result in the appointment of general managers for each service.

There should be better co-ordination between the London Transport Executive and the British Transport Commission. Among other things, the Committee considers that the Commission should press forward with plans for electrification and other improvements of the suburban lines which would relieve the peak-hour load on London Transport's road and rail services.

It is also suggested that (a) the London Transport Executive should be reconstituted as an entirely separate body responsible directly to the Minister of Transport or (b) its functions should be vested in the British Transport Commission which would have full control over the Board of Management which no doubt would be appointed and would in practice have much the same membership as the London Transport Executive.

Among the bodies which submitted written evidence to the Committee were the British Electrical Development Association, the London and Home Counties Electric Traction Society, and the Manufacturers of Trolley-bus Electrical Equipment.

* "Report of the Committee of Inquiry into London Transport."—H.M. Stationery Office, 5s.

Trolley-Buses in Bradford

During an address to the Bradford Scientific Association on 25th February, Mr. C. T. Humpidge, general manager of the Bradford Corporation Passenger Transport Department, mentioned that it would not be long before trolley-buses would be running on the Wibsey route in Bradford in place of motor-buses. Replying to a question he said that the cost of putting up overhead wires for trolley-buses was about £3,000 a mile. The Wibsey service was expected to pay because of the density of the service and the fact that many poles were already in position. Fares on the route would not be increased.

VIEWS on the NEWS

By REFLECTOR

COMPLAINTS of unheated waiting rooms at railway stations are extremely common and it is generally held that this is an economy measure exercised by the railways at the passenger's expense. Now, however, but still at the passenger's expense, British Railways has instituted a scheme for providing heat in waiting rooms at two of its stations—Shenfield (Essex) and New Barnet (Herts)—and presumably the arrangement, if successful, will be extended to other stations.

In each case an electric fire has been installed and the supply is through a slot meter. A notice instructs the passenger who requires warmth to insert a penny in the meter slot and turn a knob. He is told that the fire will operate for about seven minutes for his penny. The paying passenger will no doubt consider himself entitled to the front of the fire; others will presumably take seven-minute turns. Although I think that the idea is very commendable in some ways (particularly as it is electrical) I hope that it is merely a temporary expedient and that when the railways are electrified the waiting rooms will be properly equipped with thermostatically controlled heating systems.

* * *

Speaking to architectural students in Glasgow, Mr. Thomas Johnston, chairman of the North of Scotland Hydro-Electric Board, again claimed that so far from ruining the noble prospects of the Highlands his Board had actually added to them in some instances. It is certainly true that tourists have complained very little about the Board's works, and from another point of view have reason to bless them. The Board's deputy chairman, Sir Hugh Mackenzie, stated in Aberdeen recently that statistics obtained by the Scottish Tourist Board had shown that in areas where electricity had been provided amenities for tourists had been greatly improved. Accommodation had not only been doubled but in some places increased fourfold.

* * *

A strange hybrid was envisaged by the M.P. who asked the Minister of Fuel and Power if he would give a general direction to the British Electricity Authority and the Area Gas Boards to consider the advisability of introducing a meter which would measure the consumption of both electricity and gas. This, I suppose, is an extension of the idea of joint meter reading. Given the possibility of such a device, why should not further economy be achieved by using the gas piping for distributing electricity and thus eliminating unnecessary wiring?

* * *

Twice in the past I have commended the practice of Gas Boards of apologizing for, or at least explaining, road upheavals for which they are responsible. I am glad to see that at least one Electricity Board is following this example, for we should always be open to learn from our gas friends. In *Seaboard,* the South Eastern Electricity Board magazine, there is a brief account of the installation of a reinforcing 11 kV cable in the Orpington area. Mr. P. S. Watson, the district manager, decided to let people know what the Board was doing and why and so he had notices displayed at the excavations reading as follows:—

"These works are Seeboard's response to your rapidly increasing demand for electricity. Reinstatement will follow quickly."

The magazine says that the idea was highly thought of locally.

* * *

Probably the most difficult toast to handle at a public dinner or luncheon is that of "The Guests." Deciding how little or how much to say about how many of the people invited is a matter for extreme tact. It is necessary to avoid slighting any particular guest by omitting to refer to him and at the same time steer clear of boring the whole company with a long succession of brief biographies. As a rule it should be sufficient to mention the principal guest (if he has not already received attention in an earlier speech) and the person or persons who are responding to the toast. But where there are many distinguished guests it is desirable to touch upon them all. To do this effectively and acceptably is an art and I do not think that I have ever heard it done better than it was by Mr. Harold Bishop at last week's annual dinner of the Institution of Electrical Engineers. I hope that potential proposers of future toasts of "The Guests" who were present made a note of the method.

* * *

Disputes over the comparative merits of the engineer who designs and makes and the engineer who sells are not new. Fifty years ago, in the *Electrical Review* of 3rd March, 1905, the matter was raised in a paper by Mr. C. A. S. Howlett who, it was reported, "compared the contracting or sales engineer to the motive power of a machine, and in the securing of orders he placed salesmanship ability higher than engineering ability." The *Review* discussed the subject editorially. It was agreed that engineers were needed to sell equipment to other engineers but it was said that many engineers preferred to stick to the strictly professional side and considered it derogatory to go out selling—even though the pay was better. The comments concluded with this dictum:—

"The fact remains that, owing to the rate at which our technical schools are turning out electrical engineers, the supply of them is so much greater than the demand that a man of good address and average ability who can obtain orders for a machine can make on the average at least double the income of the trained engineer who designs it, and who has gone through a long, laborious and often costly technical training and engineering apprenticeship."

WORLD ELECTRICAL MARKETS

Electrification of Peru

By H. R. STERN*

THE more rapid electrification of Peru has become one of its most urgent problems. As up to a few years ago very few official statistical details were available, legislation was enacted making it compulsory for industrial undertakings to render periodical data of plant installed, electricity production and other particulars necessary for the compilation of statistics. The data used in this article were gathered and sifted by electrical engineers in official positions and are the latest available on the subject.

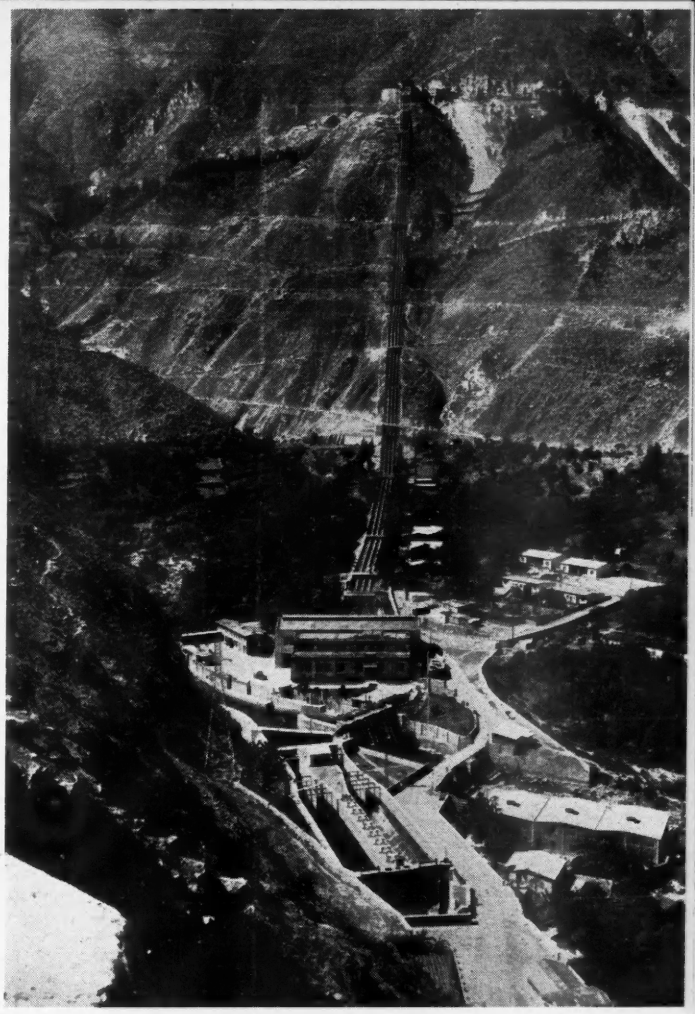
To comprehend some of the difficulties which have hitherto retarded the development of electric power production, one has to consider the topographical nature of the country. Peru forms a narrow, arid coastal strip about 1,200 miles long on the west coast of South America. From it rise a little inland the formidable mountain barriers of the Andes reaching heights of 23,000 feet. The eastern slopes of these ranges drop into the impenetrable jungles of the Amazon basin. This geographical aspect of the country, coupled with a low density of population, makes the establishment of a grid system an economic impossibility. As the mountain ranges are cut by deep fertile valleys with a higher density of population, in which rivers run either to the Pacific or Atlantic Oceans, some interconnections of power and substations may become a reality at a later date where the economical and financial advantages to be gained will warrant it.

Up to the present time, a lack of legislation creating favourable conditions and guaranteeing a fair return on capital investments by groups of local or foreign enterprises, has retarded the development of the power industry to keep pace with the expansion of the country's industries. In any event foreign capital will be required to promote the growth of the electric power industry.

A notable exception to the rule of an insufficient and inefficient power system is the capital, Lima, which enjoys an unrationed and well-run electricity supply given by the Empresas Electricas Asociadas, a company largely financed by Swiss investments. The capacity of the generating plant installed at present is about 112 MW. This power is being generated mostly in four hydro-electric plants supplied with water from alpine lakes situated just below the zone of eternal snow. The most important of these plants, with a rated capacity of 42 MW which is being enlarged to 63 MW, belongs to Hidrandina S.A., a company which is supplying the Empresas Electricas Asociadas. The engineering aspect of these schemes is most interesting.

According to the latest statistics, Lima, with its 1,000,000 inhabitants, has an annual consumption of 419 million kWh, 419 kWh per inhabitant per annum. The figures of 835 and 610 for Buenos Aires and Santiago de Chile are mentioned for purposes of comparison.

* Partner, A. Stern & Sons, Lima.



Hydro-electric undertaking of the Lima Light & Power Co. at Callahuanca

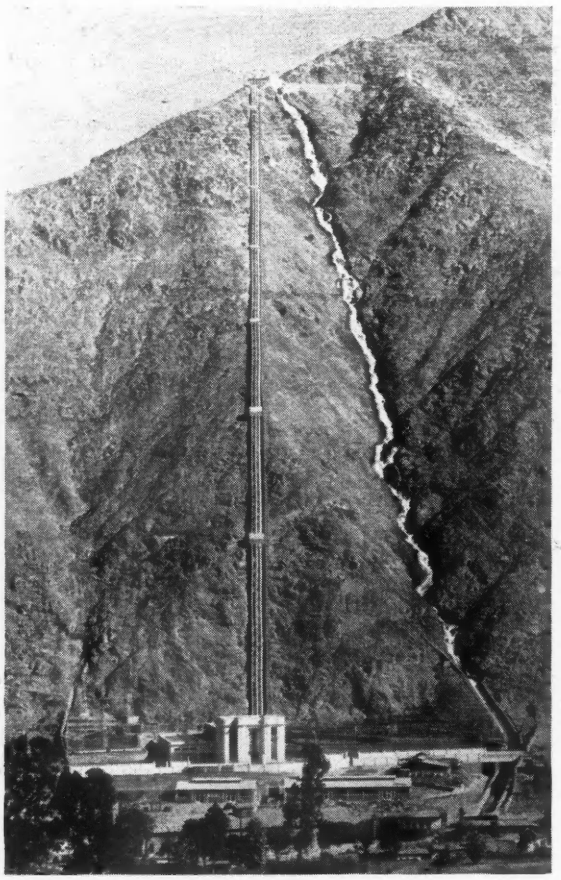
The city second in importance and in its number of inhabitants is Arequipa situated below a snow-capped volcano at an altitude of 7,600 feet. Its population is 160,000 consuming 23·4 million kWh annually, 144 kWh/person per annum. The figure for the remainder of the country is only 81·4 kWh.

The foregoing data is based on a total population of about 8,864,000 persons and a total installed plant capacity of about 160 MW for public service.

To give these statistics a meaning, it should be said that many villages completely lack an electricity supply, whereas in others the supply given may be very poor with nominal voltages of 220 dropping at peak loads to below 180. In the city of Piura, with 50,000 people, the plant is serviced in the daytime so that supply is only available during the hours of darkness. Quite recently, tenders were invited for the installation of plant and the provision of complete electricity services to this city.

The unsatisfactory nature of supplies in the provinces is responsible for the small volume of sales of household appliances among potential purchasers who are most reluctant to invest in electrical goods which they may be able to use only at intervals.

The poor power supplies outside Lima have forced many small industries, garage owners, hospitals, cinemas, farmers and owners of private residences to purchase their individual petrol-driven or diesel-engine generating sets. Although the price of petrol and diesel fuel is very low indeed (petrol costing about 10d a gallon), it is a rather uneconomical way of supplying electric power which, however, seems unavoidable at the present moment.



The Moyopampa station of Hidrandina S.A.

The electricity services dealt with up to this point are the ones given to the public and such industries which may be established in a zone with a relatively good supply. These services account for about half of the installed power plant in Peru. This figure does not include the aforementioned individual small generating sets about which there are no reliable statistical details. The other half of the total installed plant belongs to large private industrial undertakings, such as mines, oil companies and cement factories. These supplies serve only their respective industries and their employees. The most important of these companies is the Cerro de Pasco Corporation, an American company mining copper, lead and other metals, and operating smelting plants at the same time. Its annual production is 341 million kWh.

The situation is summarized in the following table:—

	Annual Output million kWh
PUBLIC SERVICE.—	
Lima	419·0
Arequipa	23·4
Remainder of country	46·0
	488·4
PRIVATE INDUSTRIAL UNDERTAKINGS.—	
Cerro de Pasco Corporation	341·0
Other mining companies	180·0
Industrial undertakings	105·0
Total	1,114·4

In order to give an impulse to the promotion of better electricity supplies, representatives of the Government, the industries and the engineering profession have got together. Realizing the growing importance of an efficient electricity supply on a nation-wide scale, they are endeavouring to accelerate the rate of construction of power stations and distribution systems to keep them in step with the increasing pace of industrialization. Their first task has been to gather and consolidate information obtained. The compilation of this data has focused the public's attention on the problem in hand, and the authorities are working on a set of laws which will tend to stimulate a farsighted development in the near future.

Up to the present there have been no regulations dealing with electricity supply. The Association of Electrical Engineers of Peru has submitted a comprehensive set of regulations covering the installation of electrical machinery for Government approval and subsequent legislation. Further legislation is proposed to encourage local and foreign investors to purchase and install the necessary machinery and plant and engage local and imported labour to carry out electricity schemes.

The following are the salient features of the proposed legislation: Periodical reassessments are to be made of the concessionaires' obligations in foreign currencies to compensate for fluctuations of the local currency. This would ensure that replacement costs of machinery would be stabilized in a certain measure to the purchasing power of the Peruvian sol. A special fund may be set up to allow for a balance to be guaranteed in the exchange rate. It is suggested that the rates shall be revised every three years or whenever the profits fall below 5 per cent or rise above 15 per cent of the sales. Interest on the invested capital would be fixed at 8½ per cent and in certain cases at 12½ per cent. The maximum deduction allowed for depreciation would be 5 per cent.

For primary and secondary distribution systems it is proposed that up to 5 per cent per annum of the investment may be deducted for a special expansion fund. The commercial profit considered as applicable would be fixed at 10 per cent of the annual value of the sales. The concessions would take the form of long-term contracts issued by the Ministry of Development and Public Works within the framework of the proposed law.

At the present time the construction of several plants is being considered and some have already been commenced. In Lima consideration is being given to increasing the plant capacity by 40 MW in the near future. The Corporacion del Santa, a Government-sponsored body which has accomplished one of the most daring engineering feats in electric power generation in the world, will put a plant into operation in 1956 with an initial development of 50 MW and an ultimate capacity of 125 MW. Part of the distribution plant was washed away during construction by floods rushing down from the precipitous mountains This has forced the engineers to re-design parts of the scheme in accordance with this experience. At the present moment the Corporacion supplies a coal washing plant, fish canneries, an anthracite briquetting plant, a coke pilot plant and the town of Chimbote. The Chimbote Steel Works which will reduce iron ores mined by the Marcona Mines and sent by ship from the South of Peru will require 38 MW.

In Arequipa a Swiss firm is installing a 4,000 kW steam-driven set which is scheduled to be put into service some time this year. As there is a plentiful supply of water, a 7,000 kW hydro-electric plant is being planned; British manufacturers have shown interest in the possibilities of financing the scheme and supplying and erecting the plant. A 2,500 kW steam-driven plant is being installed in Chiclayo by a Swiss firm with a possible extension to 5,000 kW.

In passing, it may be pointed out that although there is often sufficient water available for a hydro-electric plant, considerations of economy favour the installation of a local

thermal plant rather than a hydro plant with its high capital costs and the requisite transmission lines.

This year a 4,000 kW steam-driven generating plant will be commissioned for the Cia. de Cemento Chilca by the Swiss firm which provided and installed the machinery. The final capacity of this generating station will be 8,500 kW. Near Pacasmayo in Northern Peru a second cement factory will be built and a power plant of some 2,500 kW will be required for its operation.

Large consumer groups are formed by sugar planting combines and their mills. During the last few years most of them have replaced their steam engines and belt transmission by electric drives. In this field extensions and new installations may average about 5,000 kW per annum. Apart from these larger schemes, smaller stations will be built and extensions to existing small stations are being carried out all the time.

The reader in Great Britain may be interested in a few words dealing with electrical goods manufactured locally. For the electrical generating and distribution plants all types of p.v.c. insulated cables and wires are being manufactured. The firm turning out these cables intends to market p.v.c. insulated telephone cables. Other firms assemble h.v. and l.v. distribution switchgear on switchboards on a small scale from imported material and components. Power transformers are being manufactured locally. One enterprising firm has installed a factory producing porcelain insulators for voltages up to 25 kV.

So far as installation material is concerned, small industries turn out plugs, sockets, tumbler switches, incandescent lamps and sundry other items. The manufacture of car batteries has grown considerably and they are being manufactured completely from imported materials by some and from local sources by other manufacturers.

A few points of interest to British firms desiring to sell electrical machinery and equipment in Peru are given for information. Imports range from the smallest items such as staples, insulating tape, etc., to complete power stations (including erection and commissioning). Some goods will have to be made according to American standards, whereas for others it may be possible to offer British types according to B.S.S., indicating either their equivalent millimetric or their corresponding American sizes. Cheap mass-produced installation material of American types is being offered from German, Japanese, Italian and other sources and has almost completely displaced the well-made British article. Power cables may be offered according to B.S.I., V.D.E. or American standards. Sometimes American consulting engineers issue public works specifications to fit their own standards, making it impossible to quote for alternative types.

Apart from British firms supplying the needs of the growing power industry, there may be a limited scope for small investments in establishing industries engaged in making electrical and electronic goods.

The forecast for the next two years is that development will add plant for public service up to a total installed capacity of 193 MW and the figure for private industrial plant will top the 244 MW mark. This represents an increase of about 30 per cent over the 1952 figure.

It is estimated that by 1962 the plant capacity for supplying the needs of rapidly growing industry and of the increasing demand of the public will have to be twice the present figure. Should the requisite investments be made exporters of electrical goods and machinery will find the Peruvian market with the present existing free exchange regulations an attractive proposition, always keeping in mind the relatively small size of the individual plants.

Queensland's Improved Power Position

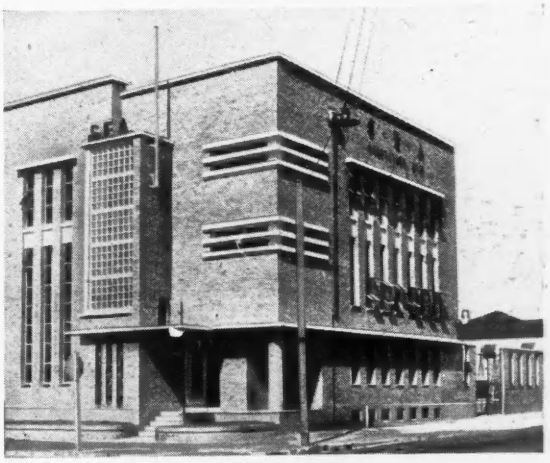
BECAUSE of a rapid development now taking place in Queensland the electricity supply industry "cannot plan and build on too large a scale." This view is expressed in the seventeenth annual report of the State Electricity Commission. It says that electricity shortages have now been overcome in nearly all parts of the State.

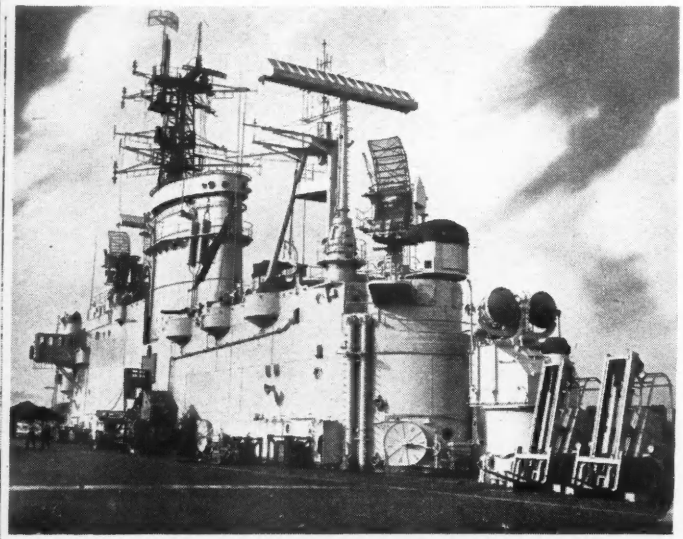
The principal supply authorities in Queensland are the Commission, with its Regional Boards; the Southern Electric Authority; and Brisbane City Council. Altogether electrical works in hand or scheduled to be started this year will involve an expenditure of some £62·3 million, of which £11·7 million will be required for the Tully Falls hydro-electric project. Actual expenditure in 1954-55 is expected to amount to £16·6 million. Help is provided by way of Government grants—so far over £1 million has been received in subsidies for the Tully Falls scheme. The report says that this assistance, and the availability of loan funds, are vital to the progress of electrical development in the State. The ultimate aim is "an unlimited electricity supply at the lowest possible tariffs." This, the report adds, is fundamental to other forms of State and national development.

In south-eastern Queensland the power position has been greatly eased by the commissioning of the first two 30 MW sets in the Bulimba "B" station of the Southern Electric Authority. The first 30 MW set at the Brisbane City Council's Tennyson station is expected to be ready early this year, with the second set to follow soon afterwards. For the Tully Falls scheme one turbo-alternator has been delivered and one was undergoing tests at the manufacturers' works at the date of the report (November, 1954). A 132 kV transmission system is being provided to link the Tully Falls generating station with the load centres.

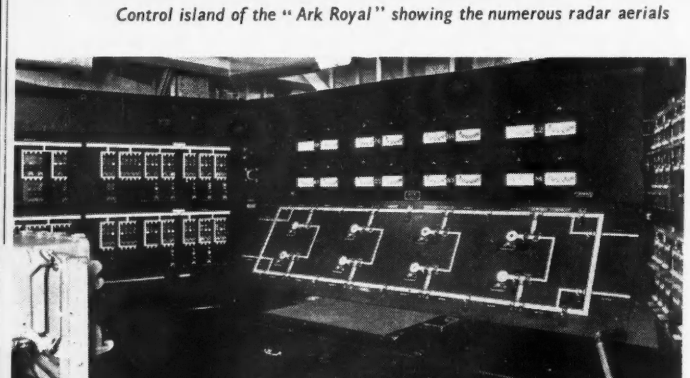
Although some details are given of output and sales in 1953-54, the latest comprehensive figures are for 1952-53. These show that the population of the area supplied was 1,171,100 and electricity consumers numbered 289,978. Sales aggregated 1,015·4 million kWh, or an average of 3,502 kWh per consumer (3,061 kWh if street lighting, water supply pumping and special bulk supplies are excluded).

The trend in modern substation construction in Queensland is exemplified by this attractively designed building in South Brisbane (Southern Electric Authority)

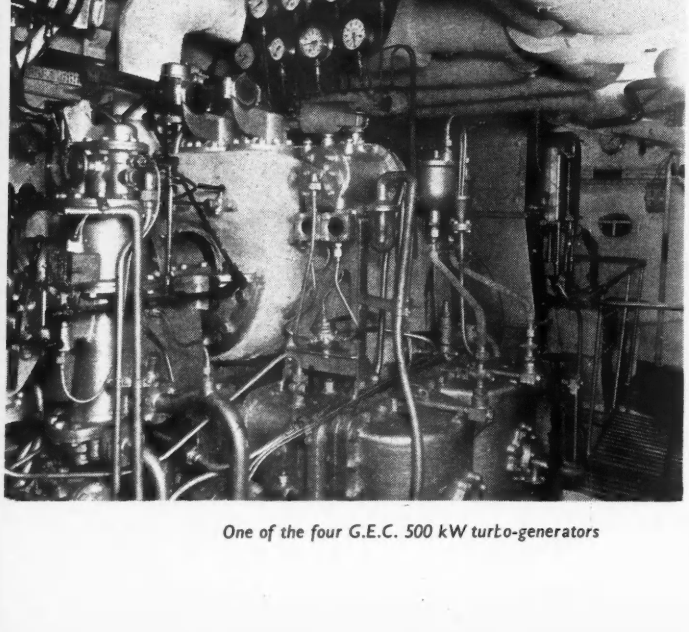




Control island of the "Ark Royal" showing the numerous radar aerials



The mimic diagram and control panel



One of the four G.E.C. 500 kW turbo-generators

H.M.S. "ARK ROYAL"

ELECTRICAL ARRANGEMENTS IN BRITAIN'S NEWEST NAVAL UNIT

THE *Ark Royal* has a displacement of 36,800 tons and an overall length of 808ft: she is regarded as the most formidable fighting unit in the Navy and has an angled deck, two steam catapults, a new type of arrester gear, a deck edge lift and a mirror deck landing aid.

The size of the electrical installation may be gauged by the estimate of 750 miles of cable of all sizes installed. A generating capacity of 4,000 kW is provided at a voltage of 220 d.c. It is possible that this may be the last major unit to be laid down with a d.c. power system as great advances have been made in using a.c. in ships and the installations in American naval vessels are now mainly a.c.

Four G.E.C. 500 kW turbo-generators operating at about 400 lb/sq in on steam from the main boilers are dispersed about the ship, and four Ruston & Hornsby/Bruce Peebles 500 kW diesel generators in pairs, also well separated. All generators are water cooled. Eight separate generating units in six different places minimize the effect of possible action damage. Distribution is by a 220 V ring main encircling the ship at a low level, with two extension spurs fore and aft.

Each generator feeds via its own circuit breakers into a separate section of the ring, capable of being isolated completely from adjacent sections by further circuit breakers. Separate breakers control supplies on the end spurs. All principal circuit breakers are waterproof and provision is made for disconnecting a generator from the ring in the event of flooding in the particular generator room, this being remote from the associated breaker room. Parallel plates suitably placed by the generator, across the supply, cause a heavy fault current on the ring should flood water rise sufficiently to reach them. This blows a fuse in a waterproof case in the breaker room; the fuse in rupturing trips the breaker of the generator concerned.

Control is from a point in the centre of the ship where a mimic diagram of the generators and ring main system occupies the centre of a three-panel suite. It is possible in emergency for the ring to be split in four laterally, each section having a cross connection and two generators together with a separate emergency control room in its own area. A remote control room for the main engines and boilers, from which they may be operated hydraulically should radioactivity in the outside air make the machinery spaces uninhabitable, is provided and the electrical control room as well as this emergency room may be occupied irrespective of outside air conditions.

On each side of the mimic diagram are control panels for the various unit boards which, fed from the ring, themselves control feeds to the principal auxiliaries of the ship. The more important of these can feed from two alternative boards and change-over switches are provided at starters where this facility is required.

Additional emergency arrangements are afforded by a comprehensive and highly flexible arrangement of spare point to point cables terminating in copper ceiling lugs,

spare wall mounted open control switches and innumerable coiled lengths of cable clipped along passages and open spaces. Almost any arrangement to supply any item can be quickly improvised.

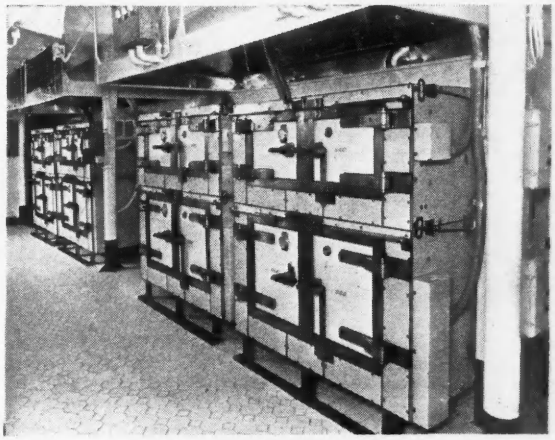
Control throughout is by a separate 22 V d.c. system fed by batteries. Aircraft servicing is catered for by 208 V a.c. and 28 V d.c. socket outlets on the flight deck and in the hangars. The growing complexity of the electrical side is illustrated by the accompanying list of the twelve supplies provided on board the *Ark Royal* for power, control, aircraft, radar, radio and miscellaneous purposes.

Electrical Supplies on the *Ark Royal*

Volts	Freq.
220	d.c.
24	d.c.
28	d.c.
208	400
230	50
180	500
120/360	250
230	50
50	50
120	333
115	60
200	1,100

More than 1,000 motors are installed, ranging from 170 h.p. to f.h.p. sizes. The galleys, bakery, and laundry are all-electric, and 10,000 lighting points, 3,000 being twin 20 W fluorescent fittings, are provided. Lanterns containing batteries are mounted in many parts of the ship and have relays connected to the 220 V d.c. system such that should this fail they are automatically switched on.

A 500 line automatic exchange is provided and there are about a thousand other telephones as outstations on direct telephone systems. Amplified speech communications involve the fitting of over 100 loudspeakers, and a further 600 loudspeakers are installed on an integrated main broadcast system. A sound reproduction system is provided for entertainment purposes, each loudspeaker and pair of headphones (in the sick bay) having a choice of two alternative programmes. Turntables for record broadcasting form part of this section together with an outside broadcast unit for " live " shows on board ship.



G.E.C. roasting ovens

The *Ark Royal* was built by Cammell Laird & Co., Birkenhead, and is commanded by Captain D. R. F. Campbell, D.S.C., R.N.

Atomic Power Debate

IN the debate on a motion welcoming the Government's programme for the peaceful use of atomic energy, Mr. Nigel Birch, Minister of Works, gave some indication of the factors which would govern the siting of the new nuclear power stations. He said that they would have to be in areas where the base load was great, where the stations did not offend against amenity, and where there were ample water supplies. The only difference between the conventional power station and the nuclear station was that it would not need such good communications because there would not be the immense traffic of coal coming in and ash going out.

The speed of development would depend mainly on how quickly men could be trained. Queen Mary College (London), Birmingham University, and Manchester University were doing good work by giving courses on nuclear and reactor physics and the Government hoped that all universities would do more in this direction. Manchester had a six-week full-time course on nuclear engineering specially designed for industrialists. Training was carried out at Harwell and a number of people from industry had been able to visit atomic energy establishments. The object was to build up teams. The Government wanted such teams from the British Electricity Authority and teams including consulting engineers, "heavy" electrical engineers and other engineering firms. These teams were being trained and the Government hoped they would be able to take care of the plans that were being made.

Stringent precautions were taken in all atomic energy stations against the effect of radiation on the human body and the safety record so far had been extraordinarily good. There could be no question of an atomic explosion in a nuclear power station because the fissile materials were so diluted with other materials that there could never be a critical mass sufficient in size to cause an explosion.

Great advances were being made in the techniques of disposing of atomic waste. The method depended on the degree of radio-activity. Some went into the air, some was piped out to sea, and some was taken in concrete or steel containers and dumped 1,000 miles out to sea at a depth of 2,000 fathoms. Some of the very dangerous material had to be stored. Strontium 90 and caesium 137 were particularly dangerous but scientists were evolving techniques to put them to useful work.

For instance, strontium 90 could be used to eliminate static charges from moving belts working in a dry atmosphere, while caesium 137 could be used for medical purposes. The point was that this was a manageable problem. If the whole of the electricity generated in this country were now produced from nuclear power the dangerous products would amount to only one or two tons per annum.

Only one-tenth of Harwell's total production of isotopes in 1953 went to industry and there was room for much expansion here; it would be a good thing if managements knew more about their use. The Atomic Energy Authority was always willing to help anybody who had a problem if it could be solved by the use of isotopes or nuclear technique.

Mr. Ronald Bell, who moved the motion—later agreed to unanimously—said that the fact that two nuclear power stations of about 100 MW were to be built in the next five years was in itself surprising, but that it should be possible to bring into actual production a further ten in the following five years really did catch the imagination and made one feel that Great Britain was ahead of the rest of the world. It was a relief to know that as we approached a critical fuel supply position, the possibility of an alternative source of energy had opened up.

There was a great shortage of graduates in natural science and of men trained in technology and he hoped the Government would try to expand the output from the universities and press on with the expansion of technological education. He thought that in the Empire, or in the sterling area, there were ample sources of uranium and thorium needed

for the new industry but the White Paper had mentioned only a period of ten years. He hoped the Government would be able to give an assurance on this subject because it was obvious that the vast new industry which would be built up would have to import nearly all of its raw materials.

Mr. Bell, like the Minister, stressed the fact that there was no danger of atomic reactors running away and turning into "junior atomic bombs." They were inherently safe because if the moderator inside them did get overheated, if the process began to go too fast, it stopped itself. Nuclear power stations were inherently safe and there was not the slightest reason why they should not be sited right in the middle of London. But he was glad that, in deference to very natural public opinion, the stations were not going to be erected in the first instance in built-up areas.

Mr. Mont Follick said that Parliament must forget the idea that all teachers must be paid the same. The scientist was a special sort of teacher, vital not merely for the development of the country but also for its very existence. If Parliament did not pay these teachers enough, they would go into other occupations.

Mr. Palmer recalled that when the House was discussing the Atomic Energy Bill he was persistent in suggesting that the British Electricity Authority should be brought into atomic energy development at a high level and that there should be men from the electrical industry serving on the Atomic Energy Authority. He felt that the Government White Paper justified that point of view. He disagreed with Mr. Chetwynd, who had seemed to suggest that the new developments should be confined to public enterprise. It was right that public enterprise should have the primary responsibility but to move away quickly from the use of nuclear energy for the sole purpose of war to the wider purposes of peace would mean bringing in private firms to play their part. For instance, the B.E.A. must use private contractors for the construction of nuclear power stations but he did not see how private contractors could be used properly unless they were given information about nuclear techniques. He did not think these stations would necessarily be more difficult to operate. It might very well be that there would be engineers who would find them relatively simple things to operate, once some of the outstanding technical difficulties about temperatures and pressures had been overcome.

The type of reactor being erected at Calder Hall used uranium in its solid form, and that method limited the temperature at which the pile could be operated, because solid uranium must be contained in a particular type of aluminium casing. He understood that the U.S.A. was making progress with a type of reactor which used uranium in some kind of solution form. He would be interested to know that Great Britain was pressing on with that type of reactor because that was more likely to be found in the power stations of the future than the reactors now being erected at Calder Hall, which followed on the models of those at Windscale.

Replying to Mr. Palmer, Mr. Birch said that in allocating money the Government had taken into account the development of new techniques. They did not want to put vast sums into a type of reactor which would be out of date almost at once. Mr. Palmer had referred to what was known as the homogeneous type of reactor. It was well-known to the Government; it was being developed and tests were being made. At some time the Government might want to put down such reactors but at this stage invention and design were going on at the same time.

Safety Measures at Harwell

IN an informal lecture on "A Service Engineer at Harwell," which he delivered to the Institution of Electrical Engineers, Measurements Section, Mr. W. E. Harris described the precautions adopted there to protect personnel from radioactivity. Exposure to gamma rays was prevented, he stated, by shielding, e.g. lead, concrete, steel, water. Vision through or over shielding was obtained by lead-glass, zinc bromide or water windows, reflector mirrors or closed-loop television. Work was done behind shielding with manipulators or other remote handling equipment.

Protection from alpha particles was more difficult as the small hazardous quantities were hard to detect when airborne. Certain laboratory areas could be used only by people in pressurized units, necessitating the provision of dressing areas with decontamination facilities and intercommunication control. Work on alpha particle emitters was usually done in "glove boxes" of various sizes to suit the equipment. Electrical equipment was commonly isolated in a separate nitrogen-filled compartment of a glove box so as to reduce fire risk, usually from overheated motors or arc faults igniting inflammable solvents. For the protection of fractional-horse-power motors, thermal cut-outs should be fitted into the windings to secure quick action.

Parallel-plate electrostatic precipitators in series with mechanical filters were used for filtering in connection with some air extraction ventilating systems. First cost was high but maintenance cost was low, although cadmium-plated batteries had corroded fairly rapidly. Disposal of liquid effluent entailed the use in one building only of 32 delay tanks and 60 pumps. To economize in water, recirculating cooling-water systems and water-ejector vacuum pumps had been developed.

Packaging coats and p.v.c. sheet fabricated by high-frequency welding were widely employed for the disposal of highly contaminated disused equipment. The health precautions described in the lecture caused a daily loss of effective working time averaging 1·64 hours per man.

New Zealand Heavy Water Project

IN July last year it was announced that the New Zealand and United Kingdom Governments had agreed to proceed with a project for the production of heavy water and electric power from geothermal steam in the Wairakei district of New Zealand. To carry this out a company has now been incorporated in which the New Zealand Government and the United Kingdom Atomic Energy Authority are the sole shareholders.

The project has been under prolonged study by scientists and engineers in New Zealand and in the Atomic Energy Research Establishment, Harwell, in collaboration with Messrs. Merz and McLellan (consultants to the New Zealand Government on electric power) and Head Wrightson Processes, Ltd. (consultants to A.E.R.E. on heavy water). In November last a British Mission, including a number of scientists from Harwell, went to New Zealand to discuss details. As a result of the Mission's visit, an agreement was entered into between the New Zealand Government and the Atomic Energy Authority which provided for the formation of the company.

The company will employ the New Zealand Ministry of Works as its construction agent. It is to have a nominal and paid-up capital of £30,000, one-third of which is to be provided by the Authority and the rest by the New Zealand Government. The remainder of the capital requirements will be provided by loans. Those for the heavy water plant (estimated at £2,000,000) are to come from the Authority and those for the electric power equipment (estimated at £4,000,000) from the New Zealand Government. The directors comprise three representatives of the New Zealand Government and two from the United Kingdom Atomic Energy Authority. The first directors are Sir Donald Perrott and Mr. A. S. White (U.K.) and Messrs. B. C. Ashwin, A. E. Davenport and C. W. C. Turner (N.Z.).

It is envisaged that production of heavy water will begin late in 1957 and of electric power a few months later. Initial plant will produce electric power at a rate of about 40,000 kW and a useful tonnage of heavy water for nuclear power reactors. The Authority undertakes to purchase from the company the whole of the output of heavy water and the New Zealand State Hydro-Electric Department the whole of net electric power available.

Shortage of Technologists

Speeches at the I.E.E. Annual Dinner

ABOUT 1,400 members and guests took part in the annual dinner of the Institution of Electrical Engineers which was held at Grosvenor House, London, on 24th February, when Sir Raymond Evershed, Master of the Rolls, was the principal guest, and Mr. J. Eccles, C.B.E., B.Sc., President of the Institution, took the chair. In proposing the toast of "The Institution of Electrical Engineers," Sir Raymond Evershed said that probably the great majority of mankind stood somewhat in terror of the electronic brain and other "frightful things" that electrical engineers had invented. The rest of mankind found themselves retreating with ever increasing speed from that which had been described as the "implacable offensive of science." "We are afraid," he said, "because we wonder whether the technicians have too great an advantage over the rest of mankind."

It was in that connection that the Institution provided consolation to rather frightened minds, because electrical engineers would not forget that they were members of a profession, and any professional man must always have in mind that in all he did relating to his profession there was no standard which could be too high. The Institution therefore not only served a great purpose to its members, but it was an equally great comfort and assurance to the rest of mankind.

Sir Raymond also commended to members the consideration that however absorbing their professional studies might be and however great the capacity required to absorb the necessary requirements for professional status in electrical engineering, it should never be forgotten that knowledge of that particular branch of applied science was but a part of the total sum of human knowledge, and that if it were to render its most useful service to mankind, it must always be in proper relation to the rest of human knowledge.

Basis for Prosperity

In response to this toast the President said that if an acceptable existence were to be provided in this country for 50 million people, many more scientists and engineers were required to wrest more secrets from the bosom of nature and to constrain them to meet man's needs. It was surprising how many people did not believe that and still clung to the idea that by some magical "hangover" from our great industrial past and financial power the country would enjoy its proper share of the markets of the world. "They seem to think that our reputation is enough," he said. "They cannot get into their heads that price, quality and delivery are the main things that matter in this great world which is bristling with commercial acumen and scientific knowledge. This inertia must be overcome because we as a country cannot afford to have anything but the best if we are to maintain our place."

At the moment the middle distant future was not too bright. The nursery of science was in the primary and secondary schools, and at the present time there was a great dearth of science teachers. Teaching science to boys was a hard task. The rigorous discipline of the laboratory did not go down too well with boys between the ages of ten and fifteen. There was also a tendency in some schools to lean towards what they were pleased to call the "humanities," as if science was not the greatest humanity of them all. "I agree that a classical education is of the greatest value," said Mr. Eccles, "but I should like to see the introduction of a system whereby every boy with ability in mathematics and an aptitude for mechanics is exposed to the elements of science so that later he will be able to judge and to choose where his future lies." More science teachers were needed in the schools and an improved and extended system of technical education was necessary if there were to be enough scientists able to think fundamentally and to lead those of more limited perception.

Pattern of Technical Education

The recently announced nuclear-energy electricity-supply programme emphasized and underlined the importance of having first-class men. That need would be met by providing ample remuneration and prospects for the science teachers in schools and technical colleges so that they would be at least on a par with people in industry. It would be met by the Minister of Education providing some basis for the future pattern of technical education, and it would be met by parents encouraging their children to adopt a scientific career. In the proposals which the Government was making for technical education it was of extreme importance that the students should receive a comprehensive course including mathematics, physics, chemistry and engineering technology, and that they should receive it in colleges which were adequately equipped and competently staffed.

The content of the course and the quality of the college were of great importance. "As we see it we cannot afford to go into the future backwards, as we are apt to do if we listen too long and too often to those who have not yet woken up to the need." The three major engineering Institutions were doing all they could to point the way and to maintain a standard. Their advice and help were always available. It was felt that it would be a disservice to the country to lower the requirements for entrance to membership. Corporate membership of the Institution conferred professional status which was itself a very special thing and, concluded the President, "we cannot concur in any proposal which might create or tend to create a crop of sub-standard young men calling themselves engineers but who may not be able to qualify for membership of the appropriate Institution."

Mr. Harold Bishop, C.B.E., B.Sc.(Eng.), immediate past-president of the Institution, in proposing the toast "Our Guests," said that the Civil Service, the armed forces, public authorities and industry were all searching for more engineers. They were all suffering from the shortage, but the Institution's help in the matter with the accumulated knowledge of its 38,000 members was available to assist in solving the problem. It was to be hoped that the work of the electrical engineer would be increasingly recognized in public administration. After all, production in this country together with the standard of living depended very largely on the trained engineers.

Lord Citrine, chairman, British Electricity Authority, replying to the toast on behalf of the guests, said that lying at the base of British prosperity was the prosperity and activity of the electricity industry. He felt personally

gratified by the very clear indication and recognition in the White Paper on nuclear power of the importance of the industry. "I only hope," he said, "that it will not be necessary year by year to convince somewhat sceptical Treasury officials about the importance of carrying that programme through, costly though it is in capital investment." Lord Citrine said he considered that the White Paper was a sober statement of the possibilities of the generation of electricity from nuclear energy.

Magnetic Measurements

A THERMAL method of measuring iron losses in sheet materials at any flux density, including those in the magnetic saturation region, was described by Professor F. Brailsford (London University) and Dr. Bradshaw (Signals and Research Establishment) on 1st March at the Institution of Electrical Engineers (Measurements Section). The authors pointed out that iron loss data had not hitherto been available for inductions above about 1·8 Wb/m^2, whereas tooth flux densities in motor and generator punchings often greatly exceeded 2·0 Wb/m^2 (20 kilogauss). Results obtained at 50 c/s indicated that the hysteresis component of the total loss for iron, silicon-iron and cobalt iron reached a saturation value at high flux densities. An empirical relation between hysteresis loss and magnetization intensity was proposed for the upper part of the loss curve and for use with hot-rolled non-oriented silicon-iron materials; by this means the upper part of the loss curve could be predetermined if the lower part were known. The relation applied closely to samples of dynamo-iron moderately close to 3·5 per cent silicon iron, but indifferently to three other silicon-iron materials.

At the same meeting particulars of a new d.c. precision permeameter were given by Dr. C. D. Mee (M.S.S. Recording Co.) and Dr. R. Street (Sheffield University). This apparatus, which retained separate compensating m.m.f. for flux leakage, was stated to have been used for routine B/H characteristic measurements for twelve months, generally halving the time of testing and improving the accuracy and reproducibility of low-field measurements, thus making possible rapid routine testing of high permeability grain-oriented silicon iron. Values of H from 10^{-3} oersted upwards could be measured. A saturable-inductor field-measuring device was used to give automatic and continuous indication of the required compensating-coil current at all points on the B/H curve or loop.

High-Frequency Radio

FOUR papers were presented at a meeting of the Radio Section of the Institution of Electrical Engineers on 2nd March. The first two, by Mr. E. N. Bramley (D.S.I.R.), dealt with directional measurements and fluctuations of short radio waves. In one paper the author compared observations on first- and second-order F-layer echoes from a pulsed transmitter at 5 to 8 Mc/s which were made at two direction finders, 213 km apart. First order bearings over the two paths showed negligible correlation between similar components of random ionospheric tilts at points 106 km apart. Relatively small average tilts showing a regular diurnal variation occurred over an hour, which were correlated over wide areas. The mid-points of the two paths lay on land and on sea and comparison of directional variations exhibited by the second-order echo showed that the land behaved as a rougher reflector than the sea. The resulting difference in the total variance of bearings on this echo was small, as it was mainly caused by ionospheric tilts.

The second paper dealt with rapid directional fluctuations of short waves reflected at the ionosphere. Measurements of these observed on single-component first-order ionospheric echoes at vertical and oblique incidence (700 km) at 2·5 to 10·5 Mc/s had indicated r.m.s. angular deviations under quiet ionospheric conditions of 1 deg or less. They were appreciably greater under ionospheric storm or spread-F conditions. The fluctuations were uncorrelated at an interval of 5 sec. A layer of irregular ionization density within region E would account for the quiet condition results, which would require random variations of the phase path through the region of only 3 m at 5 Mc/s. E-layer results appeared to be affected by partial reflections at different levels within the region.

The third paper, by Mr. W. C. Bain (D.S.I.R.), discussed the implications of bearing observations made with an Adcock direction finder on distant high-frequency transmitters at a rate of five per second. The auto-correlation functions calculated from the variations in bearing given by the Adcock direction finder did not conform closely to any simple analytical form, but an approximate formula was suggested.

The last paper, by K. C. Bowen (Admiralty), referred to experiments carried out to assess the relative importance of the various sources of error in U-Adcock high-frequency direction finding. Statistical methods were adopted for calculating the several contributions to the total variance of error, with especial reference to wave interference. Contributions from observational error and the effect of ground resistivity over the direction-finder site were estimated.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Shortage of Technologists

THE letter from "Another Third Assistant Engineer" in your issue of 11th February indicates, on the part of the writer, an extremely narrow and inexperienced mind. His view that "the electricity supply industry could operate just as successfully without every single commercial employee" gives support to the opinion sometimes expressed that engineers are unsuited to become top executives.

"A.T.A.E." refers with adulation to young men with technical qualifications. The acquisition of technical qualifications is, of course, both desirable and creditable but my experience, which I feel certain must be wider and longer than that of "A.T.A.E." has taught me that, out of hundreds of young men with "qualifications" only a minority have the "qualities" necessary to make them very valuable people. Men with valuable qualities and worth in industry are found among the ranks of commercial men and unqualified men as often as among those with technical qualifications.

I myself am an engineer with technical qualifications and, whilst it is true that the works in which I am employed would not continue to run without the activities of the engineering division, it is also true that there would be no need for me and my kind were it not for the efforts of my friends in the sales and advertising departments. I also have to thank the commercial staff for seeing to my salary cheque every month and for typing and posting this letter!

Teddington, Middlesex. S. A. STRODE.

Welding Research

Enlarged Laboratories of Murex Welding Processes

EXTENSIONS to the research laboratories of Murex Welding Processes, Ltd., at Waltham Cross, Herts, have recently been completed, making them among the most modern and best equipped in the welding industry. There can be little doubt from the evidence presented to us during a visit to the laboratories that electric arc welding has an ever-increasing part to play in manufacture of all types.

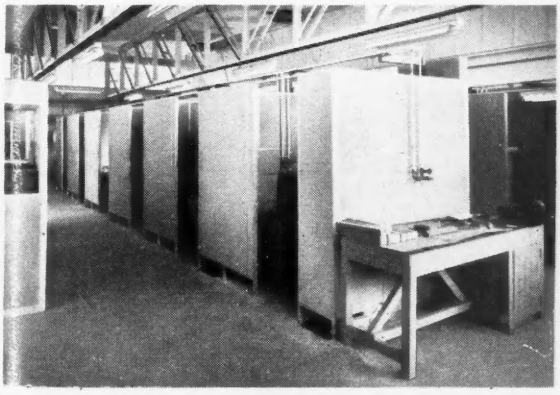
The Murex Research Department is primarily concerned with the development of new and improved electrodes but the work done falls into four categories, namely, basic research on materials and on the arc welding process; development of new electrodes for unusual applications; control of electrode quality with the production departments; and technical services to the customer. Separate laboratories are provided for welding research, electrode development, process research, mechanical testing, chemical analysis, gas analysis, metallographic and metallurgical investigations, heat treatment, physical measurements and testing, spectographic analysis, radiographic examination of welded specimens, X-ray crystallography, research on problems associated with the welding of non-ferrous metals and automatic welding research. In addition there are three dark rooms, balance, microscope and polishing rooms, a room for grinding mineral powders, a welding demonstration room, a large machine shop and electrode, chemical and metal stores.

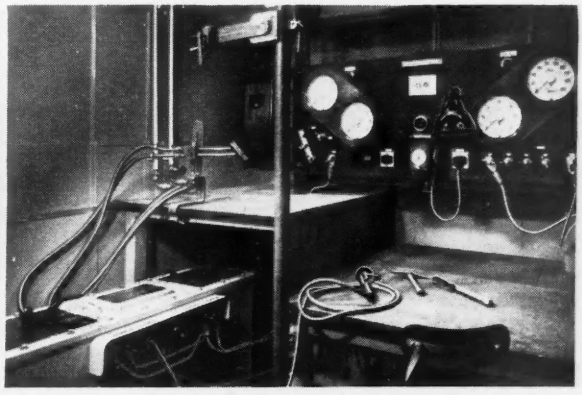
The main work of the welding research section is the testing of electrodes which are still in the development stage and which have not been released for general production, the evaluation of the suitability of established electrodes for unusual applications, the provision of welding information required by customers and the quality control testing of factory made electrodes. The section is housed in a new laboratory which contains 17 individual welding cubicles and has an extensive free area equipped for large-scale welding work and for the hot crack testing of weld metal using the Murex hot crack testing machine. The welding research laboratory contains furnaces for preheating and for the heat treatment of welded test pieces and has attached to it a demonstration room in which welding demonstrations can be given to interested customers under suitably quiet conditions.

The welding cubicles are constructed of 1½in fireproofed panels framed in extruded aluminium sections and are lined with asbestos. Each has a special control panel with 8in a.c. and d.c. ammeters and voltmeters, power sockets for electric tools and recorders, push buttons for remotely controlling current supplies from a motor generator set, indicator lights, d.c. regulators, clockwork timers, adjustable bench lamps, transformer isolating switches and change-over terminals for various open circuit voltages.

There are special heating and ventilating arrangements and either hot or cold air can be introduced into each cubicle as required. Fluorescent lighting, tool cupboards,

The welding research laboratory and (right) the inside of a welding booth in the laboratory

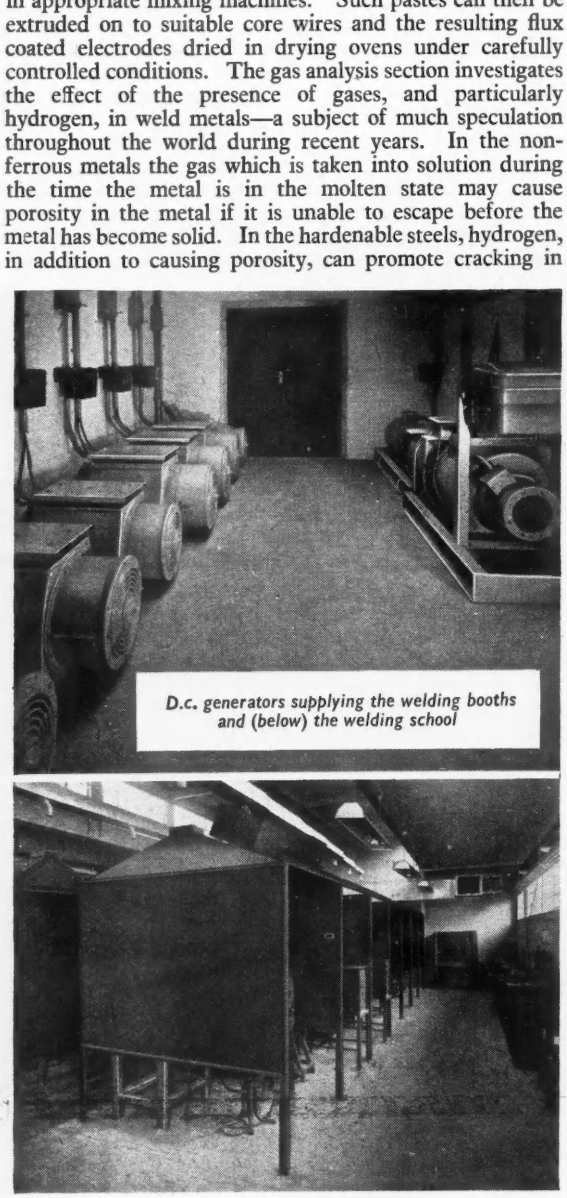




adjustable seating and other adjuncts to good and efficient working conditions are provided. An a.c. supply is provided by a Murex welding transformer and current regulator housed in each cubicle, and d.c. is supplied by remote control from one of a number of Murex motor generator sets housed in a separate plant room. The isolation of all motor generator sets has obvious advantages in eliminating undue sources of noise from the welding shop.

An automatic welding section is equipped with welding machines and ancillary equipment suitable for the development of electrodes for automatic welding. Welding currents of up to 1,500 A, either a.c. or d.c., are available for this work.

The electrode development laboratory contains complete pilot equipment for the development and production of new and experimental electrodes. Stocks of the standard raw materials used in the factory and also of unusual minerals and core wires are held in store in the laboratory and small batches of every kind of flux paste can be made in appropriate mixing machines. Such pastes can then be extruded on to suitable core wires and the resulting flux coated electrodes dried in drying ovens under carefully controlled conditions. The gas analysis section investigates the effect of the presence of gases, and particularly hydrogen, in weld metals—a subject of much speculation throughout the world during recent years. In the non-ferrous metals the gas which is taken into solution during the time the metal is in the molten state may cause porosity in the metal if it is unable to escape before the metal has become solid. In the hardenable steels, hydrogen, in addition to causing porosity, can promote cracking in or adjacent to a weld when the material is welded under restraint.



D.c. generators supplying the welding booths and (below) the welding school

Apparatus has been constructed for the study of the effects of such gases as hydrogen and nitrogen on weld metals. In the apparatus in this section a sample of steel either in the form of wrought material or weld metal can be heated in an evacuated glass tube in a furnace and any gas which is dissolved in the steel freed into the tube. The gas can then be pumped out into a measuring system and in some instances it may also be analysed. Other apparatus for the study of the solubility effects of hydrogen in steel and for the determination of the total gas content of a steel by a vacuum fusion technique is under construction.

The chemical analysis laboratory is responsible for the routine analysis of the many raw materials used in electrode production and of the weld metals deposited by ferrous and non-ferrous electrodes for quality control purposes; and the metallurgical laboratory is used by the metallurgists engaged in the study of the problems associated with the welding of steel, and the development of new ferrous electrodes. It communicates with the polishing room where specimens are prepared for microscopical examination. Metallurgical microscopes are available for the examination and photography of metal specimens at all magnifications from 3 to 2,000. Other photographic work is done in the non-ferrous laboratory. A furnace room communicates with the metallurgical laboratory and contains suitable furnaces for the routine heat treatment of metal specimens and for heat treatment investigations. Certain stainless steel weld metals are commonly used at temperatures at which any ferrite contained in the austenitic matrix would transform to the brittle sigma phase and a number of the furnaces are set aside for the quality control testing of such weld metals to ensure that there is no undue formation of sigma phase in stainless steel weld metals destined for use in service at temperatures of the order of 650 deg C.

The X-ray diffraction laboratory contains a standard Raymax X-ray diffraction unit and ancillary equipment which is used for crystallographic investigations with minerals and metals. The laboratory also houses a ferrometer which is an instrument for measuring the magnetic properties of a metal sample and for distinguishing between the magnetic and non-magnetic phases in a steel. It is used for the examination of samples of stainless steel weld metals to determine the amount of magnetic ferrite in the non-magnetic austenitic matrix since, as already mentioned, the amount of ferrite can influence the properties of the steel in high temperature service.

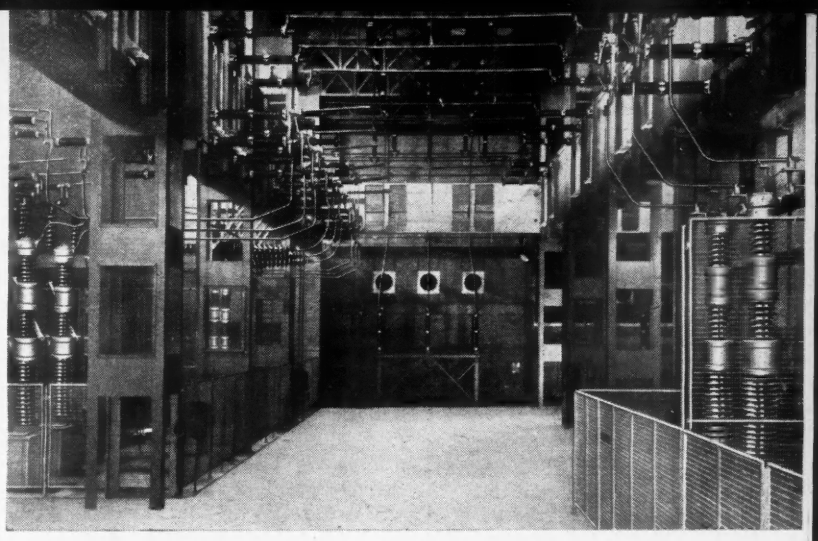
The Research Department also houses the welding school. Instruction is given to operators, supervisors and designers in courses of two weeks' duration. Operators are taught the essentials of good welding practice by large amounts of practical work and some theoretical instruction in their art during demonstration lectures. Courses for supervisors and designers are to a large extent theoretical but a certain period of actual welding experience is included. Students have separate welding booths for practical work.

The factory has a maximum demand of about 1,200 kVA the power factor before correction being only ·42 due to the large number of welding sets in use. This is corrected to ·82 by B.I. p.f. correction capacitors.

Indicative of the importance this company attaches to research is the fact that the research staff numbers about 70 against a factory staff of about 700. They are encouraged to a noteworthy degree and if the Murex example in this respect is followed by other specialist firms Britain should keep well to the fore in all new developments.

ELECTRICAL PROGRESS—1954

Activities of Ferguson Pailin, Ltd.

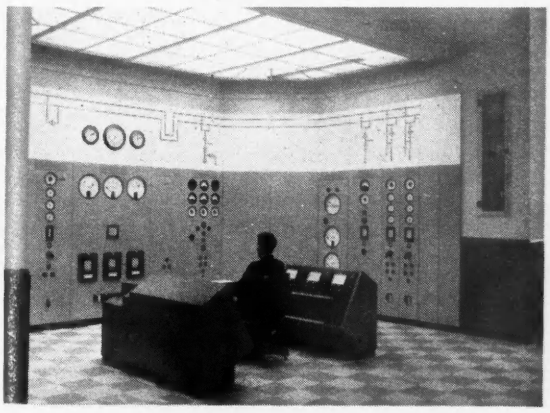


General view of the 132 kV switch house at Carmarthen Bay

THE past year has been one of increased activity for Ferguson Pailin, Ltd., in both the development and manufacturing fields. The first substation on the 275 kV supergrid, for which the company made the isolating switches, was completed; and the equipment is in course of manufacture for two other supergrid substations, at Uskmouth and Penwortham, at which the company is main contractor.

New substations on the 132 kV grid have been completed, including a seven-switch duplicate busbar installation at Kirkby, for the North-West, Merseyside and North Wales Division of the British Electricity Authority. In addition, extensions have been completed to numerous existing 132 kV substations, notably at Barrow Roosecote, Connah's Quay and Carmarthen Bay, the latter being equipped with indoor air-blast circuit breakers. A new 132 kV five switch outdoor substation is under construction at Shin, forming part of the general development being carried out by the North of Scotland Hydro-Electric Board.

At 33 kV a major reconstruction and extension programme of the distribution switchgear at Ocker Hill was completed for the Midlands Electricity Board. This scheme also included the reconstruction of the lower voltage switchgear at the substation. For the London Electricity Board, a large new substation housing nineteen metalclad units, was completed at Shorts Gardens for the reinforcement of the 22 kV distribution system. Work is in progress on the equipment for a new grid intake point to be established in the Sheffield district by the Yorkshire Electricity Board. This installation will comprise a 22-panel, 33 kV, 750 MVA indoor metalclad switchboard of modern design and performance standards, together with the associated control and relay panels and ancillary gear. Also at 33 kV three new grid intake points involving outdoor substations at Watford, Sowerby Bridge and Chester have been commissioned, while the manufacture of equipment is proceeding for a new 33 kV, 750 MVA outdoor substation at Ebbw Vale for the South Wales Board to supply the steelworks of Richard Thomas & Baldwins.



The control panels in Connah's Quay power station

In the medium voltage range a notable example of work for industrial consumers is the distribution switchgear for the control of auxiliary supplies to the Velindra works of the Steel Company of Wales, comprising one 11 kV, 250 MVA duplicate busbar and three single busbar metalclad switchboards. Mention should be made of the success of the comparatively recent introduction of the 11 kV ring main fuse-switch gear. At the lower end of this voltage range is a 3·3 kV single busbar air-break switchboard at present under construction for York power station.

Steady progress has been maintained in the overseas market, against increasing competition, and a high level of output has been achieved. Various contracts for indoor and outdoor switchgear up to 33 kV were obtained or were in progress during the year, one worth noting being an order for 20·5 kV, 750 MVA metalclad switchgear for two key substations in Johannesburg. In the same territory a further order was received for 24 indoor frame mounted 40 kV, 1,000 MVA breakers for service on the Rand system.

An order for fourteen 132 kV, 3,500 MVA bulk oil outdoor circuit breakers was obtained from the Electricity Commission of New South Wales for Lake Macquarie power station. An example of the competition now being experienced is an order obtained against 63 competitors for 50 type BV ring main 11 kV, 250 MVA substation metalclad equipments for Cairo.

The volume of 11 kV and l.v. switchgear business from the colonial market has been maintained and substantial orders for these and higher ratings have been received from other Commonwealth territories.

In addition, the demand for the auxiliary products, such as rotary and control switches, which were mainly introduced for use in the company's own switchgear, but which, due to popular demand are now manufactured in bulk, is an example of the confidence which engineers have in the reliability of these small but vital components.

Industrial Art Bursaries

THE Royal Society of Arts has announced the results for 1954 in its industrial arts bursaries competition. In the domestic electrical appliances section, a bursary of £150 has been awarded to Mr. P. D. Durden (Birmingham College of Arts and Crafts). Mr. P. Cambridge (L.C.C. Central School of Arts and Crafts) was commended. In the electric light fittings section, Mr. D. B. Gale (L.C.C. School of Arts and Crafts) has been awarded a bursary of £150. An exhibition of winning and commended designs will be held at 6-8, John Adam Street, Adelphi, from 16th to 28th May.

Engineering in Europe

Abstracts from Foreign Technical Journals

SINCE the technical principles of the use of shunt-capacitors for reducing voltage fluctuations and active losses in transmission and distribution systems are well established, the economics of capacitor installation and operation in individual systems and of their use for VAr supply has gained in interest and will be decisive for the choice of capacitor types and for their positions. In this connection the questions whether centralized or "concentrated" capacitor banks or distributed capacitors are more favourable and whether they should be placed in the medium or low-voltage system are of considerable importance. The data on which the answers to these questions have to be based are partly statistical and depend on whether the relays used for capacitor control are of the voltmeter or VAr-meter type.

The theoretical considerations are first explained with reference to the simplest case of a feeder supplying a single consumer and then extended to the case of a line supplying distributed loads. The economic calculations in which possible savings by fixed and commutable capacitor banks are determined and compared with the corresponding outlay are given in full detail and divided into the special cases of voltage control with and without reduction of active losses, of banks inserted in the medium or low-voltage system, and, finally, fractionated capacitor banks installed at the consumers' premises for VAr production. The concluding section supplements the technical information by supplying examples of capacitor equipment suitable for l.v. and m.v. systems.—"Improvement in the Operating Conditions of Distribution Systems by the Use of Shunt-Capacitors," P. Gaussens, *Bull. Soc. Franc. Elect.*, 7th Ser., Vol. 4, No. 47, pp. 675-698, November, 1954, in French.

Electrical Accidents

The different character of the physiological effects of accidents with high and low voltages has long been recognized and particularly the ventricular fibrillations set up by comparatively low voltages and becoming fatal unless stopped within 10-15 minutes, have been studied extensively for a long time. There are now several methods known by which fibrillations can be interrupted, the most interesting of which is the application of a h.v. impulse; the same result is also obtainable by injections.

Once the fibrillations are arrested, it is not difficult to reinitiate normal heartbeats. All depends, however, on a correct method applied in good time. Also, though this is not the rule, there may be minor consequences for the victim in the form of affections of the vegetative nerve system which are difficult to diagnose and may take a long time to subside.

A quite different aspect is presented by h.v. accidents which are often not immediately fatal, but mostly cause severe burns (which l.v. accidents do not, as a rule) and it is not always these burns in themselves which may prove fatal, but their consequences, viz. the decomposition products of burnt muscles and tissues carried off by the blood stream and poisoning the blood. Even in this direction progress could be reported since there are methods and means of neutralizing the effects of decaying matters in the bloodstream.—"Problems of the Electric Accident; New Ideas on the Treatment of Victims of Accidents with Heavy Current," R. Fröhlicher, *A.S.E. Bull.*, Vol. 45, No. 19, pp. 812-816, 18th September, 1954; No. 20, pp. 845-848, 2nd October, 1954, in French.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Induction Protection of Cables

Whereas the high-grade steels, viz. silicon-steel and Armco steel annealed at the usual temperature, generally used for communication cable armourings, have a maximum permeability of 1,600 at 50 c/s and of 1,800 at $16\frac{2}{3}$ c/s, Armco steel annealed at high temperatures has maximum permeabilities of 2,500 and 2,900 at 50 c/s and $16\frac{2}{3}$ c/s, respectively. This represents a great advantage where it is required to obtain high reduction factors for thin cables. Armco steel will thus be the choice for armouring tapes for communication cables running parallel with transmission lines at comparatively small spacings or for railway signalling cables of electrified railways, for instance, in cases where short-circuits in power systems may imply dangers for the adjacent communication circuits.

The desired protective effect depends not only on the maximum value of the permeability of the steel armour, but also on the frequency-relation of the permeability, because a steep decline from the maximum permeability at commercial frequency would render the protective effect problematic. In this respect, too, highly-annealed Armco steel answers the purpose very well, since its permeability is still as high as 700 at 800 c/s. Lastly, the technological production processes influence the magnetic characteristics of Armco less than those of other steels.—"High-Permeability Steel Tapes as Induction Protection of Cables," P. Simon, *E.T.Z.(A)*, Vol. 75, No. 24, pp. 814-816, 11th December, 1954, in German.

De-Icing Transmission Lines

A steel-supported aluminium conductor for 230 kV, the steel core of which was insulated from the aluminium conductor was comprehensively tested for de-icing by current heat generated in the steel core. The results were most satisfactory and enabled valuable observations to be made on the influence of the atmospheric conditions on the freezing and thawing processes.

The range of air temperatures at which the tests were made was fairly wide and so was the range of wind speeds, viz. from absolutely calm weather to blizzards of 25 m.p.h. The power consumption for pre-melting existing ice coatings (i.e. causing the ice to drop) depends a good deal on the character of the coating as well as on atmospheric conditions, but it was still possible to evolve a fairly simple method for calculating the actual consumption and fusing current required in which the atmospheric conditions are correctly considered, as confirmed by the test results. A possibly even more important fact is that this method may be actually used for preventing the icing of lines altogether.—"Protection Against Icing of Transmission Lines," K. Spaderna, *E.T.Z.(B)*, Vol. 6, No. 12, pp. 432-434, 21st December, 1954, in German.

NEW ELECTRICAL EQUIPMENT

Battery Operated Fencer

Claimed to be the smallest of its kind on the market, the "Sentinel" electric fencer manufactured by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, London, E.C.4, is operated by four 1½ V dry batteries. The basic equipment consists of a pulsing unit, a battery box and an earthing post supporting these components. The voltage generated on the fencing wire is in the region of 1,200 V and this is applied to the fence for twelve milliseconds only at an average rate of 46 times a minute.

Siemens "Sentinel" battery operated fencer

When the battery is unable to correct the pulsing unit the apparatus stops working; it cannot under any circumstances produce a continuous high voltage charge. There are only two moving elements, the armature and the contact spring, and the Siemens Post Office type relay used is highly "tropicalized." All leads to the pulsing unit enter through watertight glands, as do leads from the battery box. The price of the pulsing unit is £9 5s; the battery box, batteries, earthing post, fencing posts and insulators are extras.

Daylight Monitoring Unit

A photo-electric daylight monitoring unit introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, provides automatic control of electric lighting in such places as factories, offices, schools, shops, docks, railway stations and airports.

The equipment measures continuously the amount of daylight present and when this falls below a pre-set limit, the unit automatically switches on the artificial illumination. In some instances, a clock control mechanism can be used advantageously in conjunction.

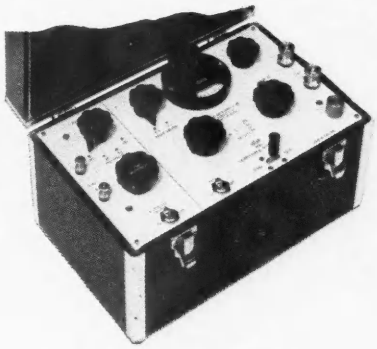
The unit is housed in a cast aluminium weatherproof case, and the self-contained single pole switching contacts have a maximum loading of 900 VA. The unit is equipped with a remote sensitivity control unit which can be situated up to 300ft away and enables the sensitivity to be varied so that the relay will operate at the required degree of daylight. The switching range is continuously variable between 0·4 and 3 lm/sq ft and the circuit is arranged so that relay "chatter" does not occur at the critical dusk and dawn periods.

The list price of the unit, which incorporates an antimony photocell and an "Osram" L63 triode valve, is £32.

Thermo-Couple Potentiometer

This instrument is a development of the standard "Mini" thermo-couple potentiometer made by the DORAN INSTRUMENT CO., LTD., Wallbridge Works, Stroud, Glos. It has two ranges, 20 and 100 mV, and is direct reading to 10 and 50 μV respectively, each of these values being represented by one division on the slide wire dial.

The potentiometer circuit is standardized against a Weston normal cell and the potentiometer current is derived from a 1·5 V dry cell fitted internally. To enable the instrument

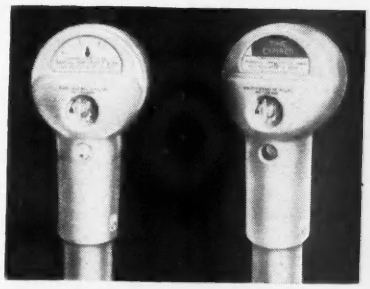

Doran "Mini" thermo-couple potentiometer

to be employed for the checking of thermo-electric indicators and recorders, an additional unit, usually known as a potential source, is provided; this gives an adjustable e.m.f. from 0-100 mV which is applied to the instrument under test. The potentiometer itself then measures the e.m.f. required to deflect the indicator or recorder to any particular point on the scale.

The instrument is self-contained and is very compact, the dimensions being 11in by 7in by 5¼in and the weight 9¾ lb.

Car Parking Meter

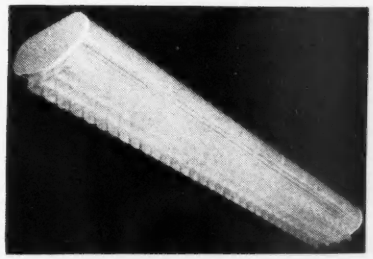
Apart from their obvious use for the collection of fees, car parking meters undoubtedly contribute to road safety by discouraging haphazard parking in congested areas. In general, meters are either pre-wound or coin-wound. The pre-wound type requires to be wound by an official at regular intervals, the clockwork mechanism coming into operation for the required time when a coin is inserted. The coin-wound meter is operated by the motorist himself. This involves only the insertion of a coin and the turning of a knob, whereby sufficient energy is stored in a spring to operate the meter for the pre-selected parking time.


Metrovick car parking meter

The car parking meter made by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, is of the coin-wound type, which eliminates the labour charge for pre-winding and also results in reduced maintenance costs by avoiding the use of an intricate mechanism. It can be provided with standard scales of 0-4, 0-2 or 0-1 hours; the 0-4 hours meter (as illustrated) is designed to give two hours' parking time for one sixpence and four hours for two sixpences or one shilling. To change the parking period necessitates only a change of dial and a change in the timing mechanism, which is effected by simply removing a small price-change unit and substituting one having a gear ratio to suit the new condition. The coin receiver is of a type that cannot be operated by a captive coin and is designed to accepted sixpences and shillings. The coin box is a totally enclosed sealable receptacle, which is only accessible after unlocking a sliding sleeve.

Fluorescent Fitting

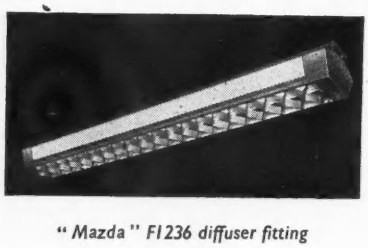
The "Cascade" twin fluorescent fitting announced by SCEMCO, LTD., 6 Soho Street, London, W.1, has a new type straight louvre and is available


Scemco "Cascade" 5ft twin fluorescent fitting

in 5ft 80 W, 4ft 40 W, 2ft 40 W and 2ft 20 W sizes. Prices range from £15 15s to £10 10s excluding purchase tax. Peach or pink colours are 10 per cent extra to list price.

Fluorescent Diffuser Fittings

Two new "Mazda" commercial fluorescent diffuser fittings are available from the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2. The new F1235 fitting has a shaped opal "Perspex" diffuser, incorporating a fully dustproof "egg-crate" louvred



"Mazda" F1236 diffuser fitting

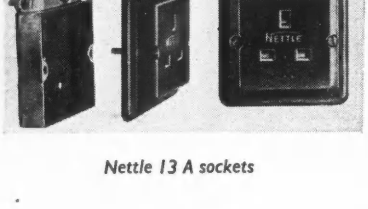
panel in clear "Perspex." The fitting presents only smooth surfaces which suffer little deterioration over long periods of use, and are easy to clean.

The F1236 diffuser unit is a less expensive fitting consisting of two metal end-plates enamelled in hard gloss cream, which retain smooth opal "Perspex" side panels and metal honeycomb louvres in hard gloss white.

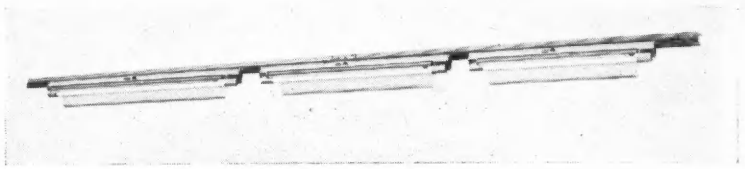
The diffuser assemblies of these and the F1234 series of fittings are attached to a flanged reflector plate on the standard "Mazda" channel power-pack by a simple "lift and engage" action. There are no hinges or clips, and each diffuser will hang from either side of the gear channel to give access to the lamps, and can be completely removed without undoing any screws or catches. The new standard power-channel incorporates several improvements, including fixed lampholders with retractable lamp-cap shields. It is available with either switch-start or instant-start lamp auxiliary gear. Prices, including purchase tax, are:—F1235, single-lamp, £27 4s; twin-lamp, £32 15s 2d. F1236, single-lamp, £15 6s 6d; twin-lamp, £20 9s 5d.

13 A Sockets

NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe, Manchester, have extended their range of 13 A sockets and switch sockets with a semi-recessed unit which can be used in



Nettle 13 A sockets



"Ediswan" shallow lighting trunking

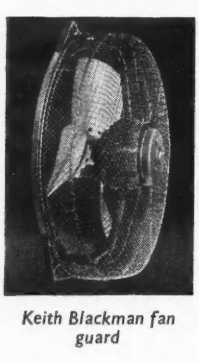
conjunction with standard shallow lug fixing switch boxes. Fixing centres are to B.S. 1299. The socket and plate form a complete unit which is fixed by only two screws.

Boxes are available in terminal and through types with two entries adjustable grip. They are produced in brown, cream and also in a new ivory finish.

The list price of the units, with plugs, but without boxes, in brown finish, is 88s a dozen and in cream and ivory finish 99s 8d a dozen.

Propeller Fan Guard

KEITH BLACKMAN, LTD., Mill Mead Road, Tottenham, London, N.17, have recently introduced a simple and highly effective fan guard which complies with all safety needs and yet offers no great restriction to air flow and does not create additional air noise. This design of guard is now fitted as standard to the company's new range of APA type fans. It will be seen from the photograph that the "vulnerable" zone is now formed cylindrically and protected by a much closer wire mesh. It is impossible to make accidental contact with any part of the fan. In the design of all APA fans, special fixing plates are incorporated with the fan ring so that this new guard may be fitted, quite simply, whether ordered at the same time as the fan or at a later date.



Keith Blackman fan guard

The illustration shows the blades unguarded on one side because when the fan is fitted in position this is the side which is generally inaccessible. If, however, the blades are still accessible when the fan is installed they would be protected by a guard of similar design.

Shallow Lighting Trunking

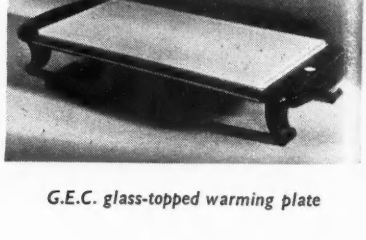
A new shallow lighting trunking now available from the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2, is designed for use with standard conduit accessories and suits standard lighting fittings. Its cost is 40s per 13ft length with accessories extra as required. The shallow form makes the trunking suitable for use in offices, stores and factories; yet, because the whole of the interior of the trunking is available for cable, there is ample space for all wiring connected with the lighting circuits and for separate circuits supplying light duty power operated equipment which may be mounted on the trunking or fed from socket outlets placed at any desired position on the run.

The 18 s.w.g. steel channel is 4½in wide by 1½in deep, and it is "Bonderized" and enamelled. The 13ft lengths are coupled together by junction pieces to form a continuous run along which any standard type of lighting fittings can be placed as required. The trunking is also available in extruded aluminium.

"Ediswan" trunking is suitable for all normal methods of suspension by chain or conduit, considerably fewer structural suspension points being required than for an equal number of fittings suspended individually. It is particularly suitable for recessing in plaster or in acoustic tile ceilings. In buildings under construction the trunking can be mounted before concrete is poured, to create concealed cable runs with a flush surface.

Warming Plate

A feature of a new electric warming plate introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is a heat-resisting, non-scratch glass top which is easily removed for cleaning purposes. This is held in position by two studs and the 250 W element is housed underneath. To ensure that the warming plate shall not spoil the table surface a sheet of asbestos has been placed immediately under the element. The rolled sides of the warming plate are finished in chromium plate and the end brackets and feet are of heat-resisting black Bakelite material. The heating surface measures 18in by 10in. The price, complete with 6ft of three-core flexible, is £7 10s.



G.E.C. glass-topped warming plate

PARLIAMENTARY REPORT

IN the House of Commons last week Mr. Kenneth Robinson asked the Minister of Transport and Civil Aviation how many years the electrification of the London-Midland main line from Euston to Crewe would take to complete; at what stage the Euston-Rugby section would be begun; how long this would take to complete; and when structural work was expected to start.

Mr. John Boyd-Carpenter replied that it was not possible at this stage to give dates with respect to particular items of the modernization plan. The British Transport Commission would, however, publish annual forecasts.

Transport Bill

During the committee stage discussion of the Transport (Borrowing Powers) Bill, when no amendments were moved, many members expressed doubts about the ability of the modernization and re-equipment scheme to make the railways solvent. Mr. Boyd-Carpenter, Minister of Transport, said the Government's view was that the new plan would greatly improve the Transport Commission's capacity to earn its own living by obtaining more efficient equipment. The major electrification schemes would bring an improvement in net earnings and would help towards achieving solvency.

London Tube Proposal

The proposed Route C tube railway for London was referred to by Mr. Hugh Molson, Parliamentary Secretary, Ministry of Transport, when replying to the debate. He said neither the Transport Commission nor the Government were in any way committed to undertaking this great and costly Route C project. Before it was possible to make a decision it was essential that a survey should be carried out, trial borings taken, and owners and occupiers of all land consulted. The reason for including in the Bill the necessary statutory powers was to enable the work to be started without any delay once a decision was made. In favourable circumstances the railway could be opened to traffic about five years after the decision had been made to begin the work. This Private Bill procedure also enabled any persons or interests aggrieved by the proposals to file a petition against the Bill.

At present there was no direct route across Green Park and consequently there was heavy congestion at Charing Cross Underground station and also on bus services. The new tube, making connections with the Bakerloo line, would be very valuable. There was also heavy pressure of traffic to the north-east of Green Park. The electrification of the Enfield-King's Cross line would cause a great increase in the traffic from the north-east into the centre of London.

There was no doubt about the desirability of the tube from the traffic point of view. The difficulty arose from the financial angle. The cost of the tube, including the necessary rolling stock, would be about £50 million which, with interest at 4 per cent and reasonable provision for redemption of capital, would involve an annual charge of £2 million. To this would be added working expenses amounting to more than £1 million a year, at present prices. London Transport believed, on that estimate, that the tube would be operated at a substantial annual loss. This meant that a most desirable improvement in travel facilities in London could not be undertaken without fortifying the finances of London Transport, which was already in deficit, partly as the result of the recent wage award. The House would realize, therefore, that it was not possible for the Transport Commission or the Government to make a firm decision at the moment about whether the tube should be constructed or not.

Board Members' Salaries

Mr. Grimond asked the Prime Minister if, in view of the report of the Advisory Committee on the organization of the National Coal Board, he would review the remuneration of the heads of the nationalized industries.

Sir Winston Churchill said the proposal of the Committee that the salaries of the full-time members of the Coal Board should be substantially increased was connected with the view that some members of the Board's staff should receive £7,500 a year, and this was involved with other recommendations. It would be necessary to learn the views of the Coal Board, as now constituted, on all of these recommendations before a decision could be reached.

Mr. Grimond said that while large salaries were paid in private industry it was unfair that people who ran the nationalized industries should be paid very much less for equivalent work. Would the Prime Minister consider putting up the salaries?

Sir Winston Churchill said that he thought the course he had indicated was the best.

Mr. Grimond, in a written question, asked the Chancellor of the Exchequer what were the net salaries, after tax, attached to the offices of the chairmen of the Transport, Gas, Electricity, and Coal Boards, assuming the incumbent was a married man without children and no other source of income.

Mr. Butler replied that the amounts were £3,425, £2,887, £3,425 and £3,225 respectively. These figures assumed that any allowances received in addition to the basic salary were completely absorbed in meeting expenses allowable for tax purposes.

Electricity Borrowing Powers

Mr. T. W. Jones asked the Minister of Fuel and Power whether he would introduce legislation to increase the borrowing powers for capital expenditure of Electricity Boards in the light of the programmes of nuclear power, and in view of the need for a rapid expansion of the electrification programme.

Mr. Joynson-Hicks, Parliamentary Secretary, Ministry of Fuel and Power, replied that the British Electricity Authority at present had unused borrowing powers of about £675 million and this would accommodate all possible capital expenditure on nuclear power stations within the next few years.

Sale of Dollar Stocks

Replying to Mr. Gaitskell, the Chancellor of the Exchequer said that a large number of Government-held dollar stocks were being offered for sale, at London market prices, and gave a list of the stock concerned. This showed that among the bonds offered were some in the American and Foreign Power Company, Inc. (5 per cent gold debentures), and among the shares were some in the American Power & Light Company, the Electric Storage Battery Company, the Pennsylvania Power & Light Company, and the Union Electric Company of Missouri.

Asked why it had been decided to sell these securities, Mr. Butler said that the dollar income would accrue to this country. There was nothing very remarkable in 15 million dollars' worth of these sales taking place, he added.

Radiation Hazards

In reply to Mr. Davies, Mr. Harold Watkinson, Parliamentary Secretary, Ministry of Labour, said that the precautions taken at factories to protect workers from ionizing radiations were carefully watched by H.M. Inspectorate of Factories. The Chief Inspector had also issued an advisory booklet on precautions in the use of ionizing radiations in industry. Mr. Watkinson said that he was at present considering, in consultation with the Chief Inspector, whether in addition to the general requirements of the Factories Acts, more detailed special regulations would be desirable for factories using ionizing radiations. As regards the projected atomic power

stations, he was in consultation with the Minister of Fuel and Power regarding the measures that would be necessary for the protection of the health of the workers.

Restoration of Supplies in Scotland

Mr. Henderson Stewart, Joint Parliamentary Under-Secretary of State for Scotland, in a statement about the recent heavy falls of snow, high winds and exceptionally severe frost which created a situation of some difficulty over much of the Highlands and Islands area, said that there had been considerable interruption of telephone services and electricity supplies. He was glad to say, however, that as a result of the admirable work of the staffs of the Post Office and the North of Scotland Hydro-Electric Board the situation had largely been restored. Only five telephone exchanges remained isolated, although many subscribers' lines were still out of order. Except for an area between Dunnett and John O' Groats, all main electricity lines were now functioning.

Labour for Improvement Schemes

Mr. Frederick Lee asked the Minister of Labour what was his estimate of the increased man-power necessary to carry out the modernization of the railways, the increase in school and hospital building and the completion of the new road schemes.

Mr. Harold Watkinson replied that in view of the increasing efficiency of the building and civil engineering industry, he saw no reason to suppose that the programmes referred to, which would be spread over a period of years, would impose any undue burden on the industry. As regards demands for electrical equipment and diesel locomotives, the Transport Commission had announced that it would give advance notice of its annual programmes, and if it should appear that the labour requirements might be difficult to meet the Ministry would be glad to co-operate with the employers' and workers' organizations concerned in considering any measures that might be necessary.

Water Power and Steam Stations

In answer to Mr. Nabarro, Mr. Henderson Stewart stated that the average cost per kW installed of all the North of Scotland Board's hydro-electric schemes completed since 1945 was £114. The average cost per kW installed of schemes under construction, on the basis of estimates published with the constructional schemes, was £126, but this figure would be considerably exceeded as a result of rises in costs before the schemes were completed. The average cost per kW installed of new steam stations exceeding 50,000 kW put into commission since 1950 was approximately £60.

Replying to further questions Mr. Henderson Stewart said that in 1954 the maximum demand for electricity in the North of Scotland district was 314,000 kW, the whole of which was met by the Board from its own resources. The Board expected this demand, which was more than double that for 1947, to increase up to threefold in the next ten years. The average load factor achieved by its water power establishments in 1954 was 32 per cent.

Compensation Regulations

Mr. Palmer asked the Secretary of State when the regulations, required under Section 12 of the Electricity Reorganization (Scotland) Act, 1954, dealing with compensation to officers, would be laid before Parliament.

Mr. Henderson Stewart replied that these regulations were under consideration but he was not yet in a position to say when they would be laid before Parliament.

Electricity in Mauritius

Mr. J. Hay asked the Secretary of State for the Colonies if he would make a statement about the officially proposed nationalization of the electricity undertaking in Mauritius.

Mr. Hopkinson, Minister of State, said he assumed that this referred to the negotiations for the purchase of the General Electric Supply Company by the Central Electricity Board of Mauritius. He was not at present able to add to the reply given on 2nd February.

Telephone Cables

The Assistant Postmaster-General (Mr. Gammans) told Mr. Cledwyn Hughes that 180,000 orders for telephones were at present held up because of shortage of wires in local cables. Since restrictions on capital investment were eased purchases of cable had been increased by more than 50 per cent. A further increase was planned for 1955-56, but it would take time to clear the heavy arrears of work which existed throughout the country. There was no shortage of cable producing capacity at the present time.

Cadmium Poisoning

In reply to Mr. Harold Wilson, Mr. Watkinson said that the question of ill effects from long continued exposure to small amounts of cadmium was being carefully studied.

The Transport Debate

We regret that in our report of the second reading debate on the Transport (Borrowing Powers) Bill (*Electrical Review*, 18th February) some remarks made by Mr. G. Darling on gas turbines were wrongly attributed to Viscount Hinchingbrooke.

Restrictions on Hire-Purchase

The Board of Trade announces that, as indicated in the statement by the Chancellor of the Exchequer in the House of Commons on 24th February, it has made an Order imposing restrictions affecting the initial deposit and the repayment period in certain hire-purchase and credit sales agreements entered into after 24th February. Under this Order, the minimum initial deposit is 15 per cent of the cash price. The maximum period for payment of the balance is 24 months for most of the goods affected and 48 months for the others. Details of electrical and allied goods affected are given in the schedule.

The Order covers a wider range of goods than the Orders revoked in July, 1954. It includes, for example, furniture, cookers, cameras and jewellery, although it does not include commercial vehicles, coaches, office machinery and office furniture. The requirements as to minimum deposit (15 per cent of cash price) and as to maximum period for payment of the balance are however less stringent than in the earlier Orders.

The Order, which came in force on 25th February, is the Hire-Purchase and Credit Sale Agreements (Control) Order, 1955 (S.I. 1955, No. 297), H.M. Stationery Office, 4d.

Scope of the Order

Goods for which the maximum period for payment is 24 months.—Radio receiving sets and television receiving sets (including portable sets and car sets), whether or not assembled and whether or not complete; television aerials and cathode ray tubes; gramophones, radio-gramophones and record players.

Appliances and apparatus, whether mechanically operated or not, being appliances or apparatus of a kind designed or suitable for domestic use, the following:—Space heating appliances, excluding appliances (whether or not with provision for gas ignition or electrically operated combustion controls) designed to burn solid fuel only.

Dish washers; drying cabinets; washing machines and washers excluding washing machines and washers which are designed for heating water by electricity or gas but which are not otherwise designed for operation by electricity or gas; ironing machines and irons; wringers and mangles; pressure cookers; floor polishers; vacuum cleaners; water softeners; refrigerators having a storage capacity not exceeding 12 cu ft; machines for mixing, extracting and preparation of food and drink; electric kettles and other cooking utensils incorporating heating elements, including electric hot-plates; dry shavers, electrically operated; sewing machines; hair-drying machines.

Clocks and watches.

Goods for which the maximum period for payment is 48 months.—Washing machines and washers which are designed for heating water by electricity or gas but which are not otherwise designed for operation by electricity or gas, including wash boilers and coppers.

Cookers, including solid fuel cookers.

Water heating appliances, excluding appliances designed to burn solid fuel only.

Invalid carriages and vehicles specially constructed or adapted for disabled people are expressly excluded from the Order.

North of Scotland Board's Accounts

THE report of the North of Scotland Hydro-Electric Board for the year ended 31st December, 1954, was summarized in our last issue, but only brief reference was made to the Board's accounts. The salient figures are given in the accompanying table, from which it will be seen that there was a net surplus of £267,505; this compares with £14,532 in 1953.

Because of the abnormally wet year there were unusually large sales of electricity generated from spill water that otherwise would have run to waste. The favourable results of trading for 1954 were largely due to the revenue from these sales. The Board has considered it prudent therefore to set aside a sum of £250,000 to be available as a reserve to meet *inter alia* loss of revenue in any exceptionally dry year. Afted this allocation to reserve fund there was a balance of profit for the year of £17,505. This has been added to the accumulated net profit of £63,655 to the end of 1953 and the resultant credit balance of £81,160 has been carried forward.

As shown in the table, the average price received per kWh sold was a little lower than in 1953. The largest class of consumers, domestic and crofts (366 million kWh) paid on an average 1·56d; industrial consumers (267·3 million kWh), 1·41d; commercial consumers (186·2 million kWh), 1·82d; and farms (59·8 million kWh), 1·46d. For traction (12 million kWh) the average price was 1·20d and for public lighting (10 million kWh) 2·12d.

The total cost for the year of the 1,568·9 million kWh generated and purchased was £3,832,312. The 1,183 million kWh generated at hydro-electric stations cost £2,247,732, 328 million kWh at steam stations £1,149,253 and 55 million kWh at diesel stations £423,171. Payments in lieu of rates amounted to £311,871 (against £280,067).

Revenue, Expenditure and Sales

	1953	1954
	£	£
Revenue from sales of electricity, etc.	7,581,459	8,541,423
Charges against revenue, excl. capital charges ...	3,668,268	3,838,845
Redemption fund appropriations and capital repayments	1,304,538	1,513,634
Interest and stock management expenses	2,594,121	2,921,439
Net surplus for year	14,532	267,505
	million kWh	kWh
Sales in Board's Area	846	943
Sales to B.E.A. (South Scotland)	304	390
Average revenue per kWh sold, Board's Area ...	1·583d	1·563d
Average revenue per kWh sold, B.E.A.	1·165d	1·046d
	d	d
Costs per kWh sold	1·4710	1·3656
Generation and purchase	0·7540	0·6902
Transmission	0·1109	0·1077
Distribution, including transport, etc.	0·4261	0·3948
Payment in lieu of rates	0·0585	0·0562
Management and general	0·1126	0·1083
Staff housing	0·0089	0·0084
Cost per kWh generated/purchased	0·6490	0·5862
Hydro-electric	0·5171	0·4558
Steam	0·7907	0·8417
Diesel	1·8912	1·8580
Electricity purchased from Boards	1·3601	1·3637
Other purchases	0·7064	0·7765

The Board's report and accounts are published by H.M. Stationery Office, price 2s 6d. Appendices contain details of the Board's tariffs, the report of the Electricity Consultative Council for the North of Scotland District, and statistical tables.

Monopolies and Price Rings

DURING a debate in the House of Commons last week on an Opposition motion deploring the Government's slow progress in dealing with the harmful effects of monopolies and price rings, Mr. Harold Wilson, who was President of the Board of Trade in the Labour Government, condemned the practices of some trade associations in enforcing fixed prices by means of "Star Chamber" courts. He said that not all price rings were completely rigid. Sometimes, when a trade ring failed to regiment the market entirely and one or two private companies managed to survive, the ring formed a "fighting company" to go in and blow the survivors out of the water by selling in their area at far below the cost of production. The losses of the private company were met by a special levy on the monthly sales of the members of the ring.

He said that the Government's doctrinaire approach prevented them from using the vital weapon of price control. The Monopolies Commission advised the President of the Board of Trade to use this weapon in connection with electric lamps, and he agreed to do so. But, looking at the last Board of Trade report—that for 1953—he (Mr. Wilson) found that it stated: "The Electric Lamp Manufacturers' Association increased the prices of their electric lamps on 30th November, to cover increased costs of manufacture. The justification of the increase is being examined."

"What a way to run a system of price control!", said Mr. Wilson. "They let the monopoly increase prices first and then proceed to investigate to see whether that increase was justified. Price control is essential in dealing with this industry." There were, however, other weapons. For instance, they could use the weapon of Government buying power. The House knew that in the case of cables the British Electricity Authority and the General Post Office were the best protectors of the public by reason of the enormous buying power which they could use against the cable ring.

He said that the Opposition wanted the Government to introduce legislation to ban exclusive dealing, stop lists, collective boycotts, "Star Chamber" courts, retail price maintenance and anti-co-operative discrimination, and called on the President of the Board of Trade to enforce the registration of all trade associations with price-fixing powers and to have a special register of all arrangements and conspiracies in restraint of trade.

Mr. Peter Thorneycroft, President of the Board of Trade, said there was a whole range of restrictive practices which had been woven into the British industrial system, not recently, but over a long period. Why did men devise these complex arrangements? He believed that they did not do so out of greed or to amass profits, but out of fear—fear on the employers' side of the full vigour of competition, and fear on the workers' side of working themselves out of a job. The policy of the Government, in taking action against monopolies, could be powerfully sustained. They had strengthened the Monopolies Commission so that there was a good prospect of a better flow of reports from it, but each investigation must take time and each industry concerned must be given a chance to reply to any criticisms that were made.

The collective withholding of supplies from traders who failed to observe the conditions laid down by any or all of a group of suppliers was a very great power, far more damaging than any fine that might be imposed. In cases in the news at the moment the condition allegedly broken had been retail price maintenance but the reports of the Commission showed that this power could also be used for limiting distribution, maintaining a manufacturers' ring, and keeping demarcation lines on retail trade, and it was

common knowledge that it was used by the chemists. This group of practices had been referred to the Commission and its report, covering the whole range of industry, was nearly complete. He hoped it would give the Government a basis on which it could decide how to deal with these matters, whether by legislation or otherwise.

Mr. David Ormsby-Gore thought it might well be possible to introduce legislation banning a number of the restrictive practices. Trade associations, through restrictive practices, might retard desirable changes in our economy. He thought list price-fixing between manufacturers should be banned by legislation and there should be a total ban on the operation of fighting companies such as were controlled by the Electric Lamp Manufacturers' Association. These were quite indefensible.

Mr. John Rankin said that he had tried to find out the costs of making cathode ray tubes for television sets. He wrote to the separate firms but their replies led him to the conclusion that a group or cartel was working together to maintain the price of the tubes at a stated figure. He got in touch with the people actually making the tubes and found that the cost of the components was from 10s to 15s. With the cost of labour, overheads and the guidance of experts added, he found the manufacturing cost of the tube was about £3 10s. He also found out from the Board of Trade that the tubes imported from Germany cost, on an average, £4 each. Adding tax to the cost of such a tube, the price became £5 6s 8d. But to the person who wanted to buy that German tube—a 14in type—the price jumped up to £14, and with purchase tax, it became £18 or £19.

Mr. Rankin said that the trading profits of the British makers did not reveal a state of poverty and there was a *prima facie* case for them to reduce the price of tubes voluntarily and he hoped the Government would use their influence to bring this about.

When Mr. Thorneycroft replied to the debate later he did not refer to the point raised by Mr. Rankin. The Opposition motion was defeated by 300 votes to 267.

Electricity in Singapore

FROM a preliminary report for 1954 sent to us by the city electrical engineer of Singapore (Mr. C. C. Payne, M.I.E.E.), it is learned that the commissioning of the third 25,000 kW turbo-alternator at the Pasir Panjang generating station was delayed by the London dock strike. Auxiliary switchgear necessary for the operation of this set failed to arrive but by borrowing switchgear from the Army the Electricity Department was able to run the set early in December. It is anticipated that the fourth set will be in operation next July. At the end of the year the City Council had spent $63 million on the new station, while outstanding commitments totalled $27 million.

In his report Mr. Payne says it is imperative that No. 6 machine and Nos. 8 and 9 boilers, together with auxiliary plant, should be ordered with the minimum of delay, so that the undertaking shall be able to cope with the peak loads of 1959 and subsequent years. Last year there was a rise in peak demand of 18 per cent—from 55,400 to 65,500 kW. A total of 318·4 million kWh was generated (14·5 per cent increase). New consumers connected in 1954 numbered 5,373.

The distribution section carried out an extensive programme which included the laying of 62 miles of underground cables, the erection of 12 miles of overhead lines, and the commissioning of 44 new substations (making 279 now in service). Six new primary 22/6 kV substations were inaugurated. Manufacturers' deliveries of 22 kV switchgear and transformers were considerably delayed; this necessitated the installation of temporary gear to meet the increasing load.

The demand for hired domestic appliances continued to increase. The following represents the position at the end of the year (the 1953 totals are shown in parentheses):—Fans, 27,831 (18,285); water heaters, 3,722 (2,133); cookers, 8,195 (4,298); and motors, 424 (453).

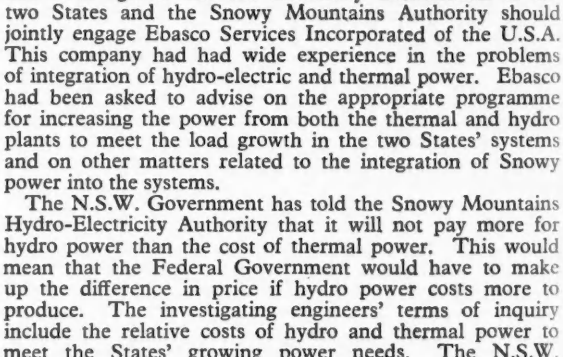
It will be seen that the increases in hired fans and domestic cookers during the year were no less than 52 and 90 per cent respectively. For the continued development of the undertaking Mr. Payne considers a comprehensive advertising and publicity campaign and the erection of an adequate showroom to be essential.

As the report was issued so soon after the close of the year the financial results are not yet available. It is estimated, however, that there will be a deficit of approximately $1 million; this is less than anticipated, partly owing to a war damage award of $800,000.

Hydro-Thermal Integration

OUR Sydney correspondent reports that three engineers from an American company are in Australia investigating the Snowy Mountains hydro-electric scheme. On 5th February the Minister for National Development, Senator W. H. Spooner, announced the engagement of the American company. He said that the integration of hydro-electric power from the Snowy Mountains scheme with the electricity systems of N.S.W. and Victoria presented problems of such complexity that the technical officers of the organizations concerned had considered it desirable to have the benefit of overseas experience. Accordingly it had been agreed that the Electricity Commission of the two States and the Snowy Mountains Authority should jointly engage Ebasco Services Incorporated of the U.S.A. This company had had wide experience in the problems of integration of hydro-electric and thermal power. Ebasco had been asked to advise on the appropriate programme for increasing the power from both the thermal and hydro plants to meet the load growth in the two States' systems and on other matters related to the integration of Snowy power into the systems.

The N.S.W. Government has told the Snowy Mountains Hydro-Electricity Authority that it will not pay more for hydro power than the cost of thermal power. This would mean that the Federal Government would have to make up the difference in price if hydro power costs more to produce. The investigating engineers' terms of inquiry include the relative costs of hydro and thermal power to meet the States' growing power needs. The N.S.W. Electricity Commission is pressing ahead with the development of thermal power stations because it says the Snowy scheme will not be able to provide sufficient power at the right time to meet its needs.



Electric fires controlled by penny-in-the-slot meters have been installed experimentally by British Railways in the waiting rooms at Shenfield and New Barnet. The notice above the meter reads: "FOR YOUR COMFORT. If you wish to use the electric fire in this waiting room please insert 1d in meter slot and turn knob to right. The fire will operate for approximately 7 minutes at full heat for each 1d inserted"

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Minister of Fuel and Power has appointed **Mr. Chris Holden,** Blackburn, as deputy chairman of the North Western Electricity Consultative Council in succession to **Mr. P. McNab Miln,** B.Sc., A.M.I.Mech.E., A.M.I.E.E., who has resigned on leaving the area.

Mr. C. J. Carter has been promoted to deputy chief scientific officer, Ministry of Supply, and has been appointed Director of Instrument Research and Development.

Mr. J. Kenyon, A.M.I.E.E., senior assistant engineer (electrical), No. 1 Sub-Division, has been appointed station superintendent at Blackpool of the North West, Merseyside and North Wales Division, B.E.A. Mr. Kenyon has served in the electricity supply industry since 1918 when he joined the Nelson Electricity Department as an apprentice. After four years as a switchboard attendant, he went to Blackpool where he served for twenty years, for twelve of which he was shift charge engineer. He later obtained an appointment at Ribble.

Mr. J. Kenyon

Mr. W. H. Warhurst, who this week retires from the position of secretary of the London Electricity Board, tells us that as from 14th March his address will be:—"Bramwood," Meliden Road, Prestatyn, North Wales.

Mr. S. Roberts, deputy managing director of Hoover, Ltd., has been appointed managing director of the company in place of **Mr. J. A. Wykes,** who has retired from the board on account of ill-health.

Mr. A. F. Roger has been appointed a director of the Automatic Telephone & Electric Co., Ltd.

Siemens Electric Lamps & Supplies, Ltd., has announced the appointment of several new assistant area managers, taking effect as from 1st January last. **Mr. H. A. Page** has commenced duties as assistant area manager of the Birmingham Branch, **Mr. J. E. Walker** at the Belfast Branch, **Mr. F. Smith** at the Sheffield Branch, and **Mr. A. Chambers** at the London area office. The new branch office and depot at West Bay Road, New Docks, Southampton, which will be officially opened on 31st March, will be managed by **Mr. A. Shaw,** who has been appointed sub-area manager. **Mr. T. O. Wilkins,** who has taken up duties as assistant area manager at the Bristol Branch, was formerly with Johnson & Phillips, Ltd.

Mr. J. S. Clark left Southampton aboard the *Queen Mary* on 19th February for a month's tour of the two Americas which will include visits to Cossor Group companies: Beam Instruments Corporation in New York, of which he is president, and Cossor (Canada), Ltd., in Halifax. Mr. Clark is joint managing director of A. C. Cossor, Ltd., and the Sterling Cable Co., Ltd.

Mr. A. Upton, manager of the Switchgear Department of Johnson & Phillips, Ltd., left by air last week for Karachi, Calcutta and Bombay. He is to make a tour of inspection of J. & P. switchgear factories in India and Pakistan and will also have discussions with the managers of the sales offices at Bombay and Karachi.

Consequent on Mr. F. J. E. Tearle's appointment to the A.E.I. Overseas Group, **Mr. F. R. Mason** has been appointed general manager of the Metropolitan-Vickers Electrical Export Co., Ltd. **Mr. G. H. Jolley** has been appointed principal representative of the Export Co. at Trafford Park in succession to Mr. Mason.

Mr. Mason joined the Metropolitan-Vickers Electrical Co., Ltd., in 1926 as a college apprentice. After completing his course in 1928 he spent several years on power engineering work, and during this time spent a year with A.E.I. (India), Ltd., as technical representative. In 1938 he became engineer-in-charge of the paper-mill section of the General Engineering Department, and he held this position until 1948, except for two years, 1942-43, when he was seconded to the Ministry of Aircraft Production for work in connection with airborne electrical equipment; in 1943 he was attached to the British Air Commission in the United States. Mr. Mason joined the Metropolitan-Vickers Electrical Export Co., Ltd., in 1948, being appointed principal representative at the Trafford Park Works, and in 1951 he was appointed to the Export Company's board. He became a member of the I.E.E. Committee on Safety Regulations for Civil Aircraft in 1945, and a year later he became chairman of I.E.E. Panels on various aspects of aircraft safety.

Mr. F. R. Mason

Mr. G. H. Jolley

Mr. Jolley joined M-V as a vacation apprentice in 1919. After technical education at the Manchester College of Technology followed by a college apprenticeship at Trafford Park, he joined the company's Erection Department, first as a special trainee and later as erection engineer, in which capacity his duties took him to Russia, South America, Egypt, Belgium, Rumania and South Africa; from 1934 to 1939 he was in China and Japan as resident engineer. During 1940-45 Mr. Jolley was assistant works engineer at the Trafford Park Works. From 1946 he represented the M-V Export Co. in Malaya and the Far East. Returning to this country in 1951 he was appointed assistant chief engineer, Energy Application Engineering Department.

Mr. H. A. Blaquiere, A.M.I.E.E., has retired from the position of district superintendent of the Manchester Branch of Insurance Engineers, Ltd. Mr. Blaquiere received his early training with the Siemens Brothers & Co., Ltd., and later with the English Electric Co., Ltd. He left the manufacture, design and testing of electrical rotating machinery to join the engineering insurance industry and in 1928 was appointed Manchester area district superintendent of the newly formed Insurance Engineers, Ltd. He served throughout the 1914-18 war, first in the Army and later with the Royal Flying Corps. Mr. Blaquiere was presented with a mains-battery portable radio from the Manchester office staff at a recent dinner held in his honour.

The annual ladies' night of the **Association of Supervising Electrical Engineers** is an informal occasion and speeches are not encouraged. At last Friday's function, which was held at the Trocadero, London, W.1, speeches were confined to a toast to the ladies and a response. Mr. S. H. Harding, national chairman of the Association, performed the first duty in light vein, and in emphasizing the men's dependence on the ladies, pointed out that ladies were to take part in the judging of the domestic section of the A.S.E.E. Exhibition. Mrs. Flood, in reply, implied that the dependence was mutual. Following

the dinner there was dancing to Eddie Lee's Orchestra, and there was also an excellent cabaret presented by Barrie Manning and his "Champagne" Cabaret.

Mr. N. F. Marsh, M.A., M.I.E.E., has been appointed deputy chairman of the North Eastern Electricity Board by the Minister of Fuel and Power, to fill the vacancy caused by Mr. T. M. Ayres' appointment as chairman of that Board. Mr. Marsh has been chief commercial officer to the Eastern Electricity Board since its inception in 1948. He was born in Malta in 1907 and after education at Oundle School and Cambridge University received his technical training with the Metropolitan-Vickers Electrical Co. He remained with Metrovick until 1932, when he became district engineer to the Mid-Lincolnshire Electric Supply Co. From 1938 to 1948 he was engineer and manager of that company. At the same time he was a director of the former Altrincham Electric Supply, Ltd., and Public Utilities (Electrical), Ltd., and supervising engineer to the Campbeltown and Mid-Argyll Electric Supply Co., and the Thurso & District Electric Supply Co. Mr. Marsh's new appointment dates from 1st March.

Mr. N. F. Marsh

The Marconi International Marine Communication Co., Ltd., announces that **Mr. A. P. Goodman** has been appointed manager of its depot at Aberdeen in succession to **Mr. V. G. Oastler,** who has been transferred to the main London depot at East Ham. Mr. Goodman has been manager of the company's depot at Hong Kong. He also acted as manager for Marconi (China), Ltd., until his return to the United Kingdom last year for leave before taking over at Aberdeen. Mr. Oastler becomes deputy manager at East Ham under Mr. C. T. Sanders and will take over as manager when Mr. Sanders retires on 1st September next.

Sir Arthur Fleming, director of research and education, Associated Electrical Industries, Ltd., has retired from executive duties. He is retained in a consultative capacity.

Mr. E. P. Grimsdick, assistant to the managing director of A.E.I., has retired from executive duties. He is retained in a consultative capacity on matters concerning India and Pakistan.

In referring to **Mr. R. H. Gummer's** election as president of the Institute of Fuel in our last issue we stated that he was a director of International Combustion, Ltd. Actually he is a director of International Combustion (Holdings), Ltd.

The fourth annual dinner of the **J. & P. Sports Club** was held in the J. & P. works canteen on 18th February. The toast of the Club was proposed by Mr. G. Whitehead, general manager (works), who reviewed the achievements of the Club. Mr. W. F. Smith, chairman of the Club, responded. The cups and medals were presented by Mr. P. E. Madden, the league secretary of the London Business House Sports Association. An excellent cabaret show followed under Mr. Harry Green's direction.

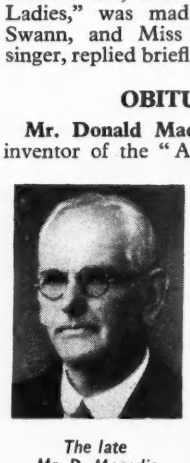
The South West England golf meeting of the **Electrical Industries National Golf Championship** will be held this year at Yelverton Club, South Devon, on 5th July. Any golfer in the electrical industry south of Gloucester and in the counties of Somerset, Devon and Cornwall, who wishes to compete can obtain particulars from Mr. A. Hughes, hon. golfing secretary, c/o British Insulated Callender's Cables, Ltd., 7-9, Barton Street, Bristol.

The second annual ladies' night of the **North East Electrical Club** took place on 21st February at the Old Assembly Rooms, Newcastle-upon-Tyne. It took the form of a dinner-dance and was attended by the president, Mr. H. H. Mullens, and Mrs. Mullens, and just over 200 people were present.

About 300 people attended the annual dinner and dance of **Davis & Timmins, Ltd.,** which was held at the Holborn Restaurant, London, on Friday last. Mr. F. Le Neve Foster, chairman and managing director of the company, proposed the toast, "Our Guests," and the response was made by Mr. W. H. Parry of the Simplex Electric Co., Ltd. The toast, "The Ladies," was made by Mr. T. G. Swann, and Miss Carole Carr, the singer, replied briefly.

OBITUARY

Mr. Donald Macadie, M.B.E., the inventor of the "Avometer," died on 13th February, at the age of eighty-three. Mr. Macadie was born in Caithness and came to London at an early age, joining the Edison-Bell Phonograph Co., and later transferring to the National Telephone Co., with whom he worked as an engineer in Liverpool and Nottingham. When the National Telephone Co. was taken over by the Post Office, he was given an appointment at the Birmingham Post Office factory, and was later put in charge of the Post Office factory at Holloway, London. Numerous devices now in common use with the Post Office emanated from him. In 193[illegible] the M.B.E. was conferred upon him and he retired from the Post Office the following year at the age of sixty-two.



The late Mr. D. Macadie

His various inventions and designs included a number of coil winding machines and measuring instruments. Since his retirement from the Post Office, Mr. Macadie devoted a considerable part of his time to the Automatic Coil Winder & Electrical Equipment Co., Ltd., which he had helped to form in 1923, to manufacture two of his major inventions.

Mr. J. O. Cheetham.—The death occurred at Bowdon, Ches., on 24th February of Mr. John Onslow Cheetham; he was eighty-six. Mr. Cheetham was with Mather & Platt, Ltd., when Mr. A. P. Wood left the company to form the Lancashire Dynamo & Motor Co. (the forerunner of Lancashire Dynamo & Crypto, Ltd.). He went with Mr. Wood to become the new company's first secretary and ultimately retired in 1938. He was the oldest L.D.C. pensioner.

Mr. Cedric Phillips Lockton, M.Sc. Tech., M.I.E.E., chief engineer of Chloride Batteries, Ltd., died suddenly on 20th February. Born in 1903, Mr. Lockton was educated at Berkhamsted School, Herts, and at the Manchester College of Technology where he studied electrical engineering under Professor Miles Walker. He obtained the degree of M.Sc.Tech. in 1923 and joined the British Electrical Plant Co., Ltd., Alloa, to work on the design of small electric motors and dynamos. In 1924 he was engaged by the Chloride Electrical Storage Co., Ltd., as assistant to the chief engineer. He specialized chiefly on the technical problems of portable and semi-portable batteries with particular reference to development work and during the war he was largely engaged in technical liaison with the Admiralty, War Office and Air Ministry on their many battery problems. In October, 1949, he was appointed chief engineer to the company (which later changed its name to Chloride Batteries, Ltd.).

The late Mr. C. P. Lockton

Mr. B. H. S. Jennings, export manager of Standard Telephones & Cables, Ltd., died at his home at Haywards Heath on 10th February after a long illness, at the age of fifty-two. Mr. Jennings joined the Cable Engineering Department of the company (then Western Electric Co.) in 1919 at North Woolwich. From 1921 until 1925 he was concerned with the installation of telephone cables in the United Kingdom and overseas. After serving a year with the Foreign

Sales Department, he was appointed in 1926 assistant manager of the branch office in Calcutta, where he remained until his transfer in 1933 to the General Commercial Department in London. He became export manager in 1938 and after being engaged on special duties at the company's New Southgate factory during the last war, he returned to his previous duties in 1945. He travelled in South Africa, Rhodesia, India, Malaya and the Middle East, and played an important part in negotiating contracts with the Syrian Government for the rehabilitation of telecommunications throughout the whole of Syria.

Mr. W. E. Evans.—The death occurred on 9th February, after an operation in the General Hospital, Birmingham, of Mr. W. E. Evans, A.M.I.E.E., manager of the Contract Department of the G.E.C. Engineering Works at Witton. Mr. Evans, who was sixty-seven years of age, was born in Yorkshire, and served an apprenticeship with Vickers, Ltd., of Sheffield. He joined the Witton Works of the G.E.C. in 1910, and after a year in the Estimating Department was appointed manager of the Contract Department, with responsibility for all important contracts for electrical plant and equipment, including the supervision of erection at home and overseas. He leaves a widow and two daughters.

The late Mr. W. E. Evans

Mr. J. J. Darby.—Mr. John A. Darby, sales and advertising manager, Herbert Terry & Sons, Ltd., Redditch, lost his only son, Jerome John, aged twenty, on 23rd February as the result of a motor-cycle accident near his home in Worcestershire.

WILLS

Lord Colgrain, chairman of the Telegraph Construction & Maintenance Co., Ltd., who died on 3rd November last, left £95,648 gross (£87,130 net).

Sir Ernest W. Petter, who died on 18th July last, domiciled in British Columbia, left estate in England valued at £859 gross (£110 net).

Mr. E. T. Hippisley, M.A.(Cantab.), A.M.I.C.E., M.I.E.E., M.I.Mech.E., manager of the Traction Department of the British Thomson-Houston Co., Ltd., who died on 9th December last, left £13,155 gross (£13,005 net).

Mr. Theodore Stevens, M.Inst.C.E., M.I.E.E., F.Amer.I.E.E., consulting engineer, who died on 18th October last, left £2,255 gross (£2,216 net).

Mr. A. D. Constable, O.B.E., F.C.G.I., M.I.E.E., retired Director of Electrical Engineering, Admiralty, who died on 12th November last, left £4,288 gross (£4,239 net).

Mr. R. E. Moore, sales representative of Foster Electrical Supplies, Ltd., who died on 20th July last, intestate, left £3,265 gross (£3,221 net value).

Lt.-Col. F. N. Fawcett, for many years with the South Wales Power Co., who died on 23rd November last, left £2,247 gross (£2,152 net).

Mr. E. N. Bray, founder of Bray Markham & Reiss, Ltd., and who later formed E. N. Bray, Ltd., who died on 18th October last, left unsettled estate valued at £7,488 gross (£7,306 net).

Mr. G. Austin, A.M.I.E.E., company director, who died on 21st July last, left personal estate in England and Scotland valued at £28,098.

Mr. P. W. Turner, formerly representative of the General Electric Co., Ltd., for Manchuria, Korea and North China, and later managing director of Surbiton Aircraft Products, Ltd., who died on 7th April last, left £25,246 gross (£24,023 net value).

Mr. G. C. Weston, M.I.E.E., A.M.I.Mech.E., F.R.P.S., chief engineer with the former Kensington & Knightsbridge Electric Lighting Co., who died on 1st August last, left £10,087 gross (£10,030 net value).

200 MW TURBO-GENERATOR

THE first 200 MW turbo-generator —which will be twice the size of the largest turbo-generator now in commission in this country and probably the largest in Europe—has been ordered by the British Electricity Authority from the English Electric Co., Ltd. An order has also been given to International Combustion, Ltd., for the associated pulverized-fuel-fired boiler plant, which will also be larger than any boiler hitherto built in this country. The boiler, operating at a pressure of 2,450 lb/sq in and 1,060 deg F with reheat to 1,005 deg, will have a steam output of 1,400,000 lb/hr.

These are the first of five turbo-generators and boilers which will be installed in a new power station to be built on the River Trent. Subject to the consent of the Minister of Fuel and Power it will be erected on a site provisionally selected at High Marnham. The station will be the largest and most efficient in the country and will have a total installed capacity of 1,000 MW and in full operation will consume about 2½ million tons of coal per year and save about a million tons a year through its improved efficiency.

Before the war, there were few sets larger than 30 MW and also, with few exceptions, the highest steam conditions were 600 lb/sq in and 800 to 850 deg F. In the six years up to the end of 1953, thirty-six standard 60 MW generating sets operating at steam conditions of 900 lb/sq in and 900 deg F were put into service and most of the sets in the programmes for the next year or two are of this size. In addition a number of 100 MW sets with steam conditions of 1,500 lb/sq in and 1,050 deg F and 120 MW sets (1,500 lb/sq in and 1,000 deg F) are projected.

The "unit boilers" associated with the 60 MW sets produce 550,000 lb/hr at 950 lb/sq in; those for the 100 MW sets 830,000 lb of steam an hour at 1,600 lb/sq in; and those for the 120 MW sets 860,000 lb of steam an hour at 1,600 lb/sq in.

Greater economy in space (and construction costs) is being achieved. An average figure for enclosed space in power stations designed in 1948 was 49·4 cu ft/kW. This compares with 30·5 cu ft/kW for those in 1952—a reduction of more than one-third. In contrast the Authority's new Willington "A" power station, the first set for which is scheduled to come into operation in 1957, will have four 100 MW generating sets and enclosed space of only 18·9 cu ft/kW. In this case the unit boilers are only partially enclosed.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £163 0s 0d
COPPER, H.C. Electro	ton £335 0s 0d
Fire Refined 99·70%	ton £334 0s 0d
Fire Refined 99·50%	ton £333 0s 0d
COPPER Tubes ..	lb 3s 2½d
Sheet	ton £402 15s 0d
H.C. wire and strip ..	ton £379 5s 0d
LEAD, English ..	ton £101 15s 0d
Foreign	ton £100 0s 0d
MERCURY	flask £109 10s 0d
TIN, block (English) ..	ton £705 10s 0d
ZINC, G.O.B. Foreign	ton £85 0s 0d
Electrolytic	ton £93 15s 0d
BRASS Tubes (solid drawn)	lb 2s 6½d
Sheet	ton £317 15s 0d
Wire	lb 3s 1⅞d
PHOSPHOR BRONZE Wire	lb 4s 8¾d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 26⅜d—26⅝d

IDEAL HOME EXHIBITION

Wide Range of Electrical Appliances on View

1

2

3

A selection of refrigerators and cookers can be seen on this section of the E.D.A. stand

AT this year's *Daily Mail* Ideal Home Exhibition, which opened on Tuesday last at Olympia, London, over 50 stands are occupied by manufacturers of electrical equipment, and undoubtedly it provides the public with the best opportunity of the year for viewing domestic electrical appliances. Practically every type of apparatus is represented and although the actual number of new electrical items is small there are many which are being shown for the first time at the exhibition.

" The Magic of Electricity " is the theme of the British Electrical Development Association's display; the centrepiece is a large top hat which is raised and lowered, revealing in turn a full-sized electric cooker, refrigerator, washing machine and a water heater. In all, over 150 individual pieces of equipment are on view on this stand, several being in prototype form. Included in the latter group is a newly developed hotplate for cookers of the future, the " Autostat," made by Arcolectric (Switches), Ltd. It is thermostatically controlled and operates on a time and temperature basis with four settings, 175, 200, 212 and 375 deg F. It is claimed that even milk or custard cannot boil over and should the pan boil dry the switch automatically cuts out. The electric " Laundry Maid " has been prepared as a prototype unit by H. Fisher (Oldham), Ltd., and takes the form of a washing machine which in addition to incorporating facilities for a rotary ironer or powered wringer is fitted with a collapsible ironing board. A special compartment houses a steam iron and has provision for accommodating a packet of soap powder. Washing machines may also be time-controlled now with the aid of a new 13 A wall socket outlet which incorporates a time-switch (Metalform, Ltd.). This again is a prototype model and its use enables a washing machine to be controlled accurately for periods up to 15 minutes, according to the type of load; for machines with heaters incorporated provision is made for manual control while the water is being heated.

Although not new in the United States the Sunbeam " Mixmaster " is being shown for the first time in this country since pre-war days and is actually making its début at this exhibition. Ten mixing speeds are possible with this food mixer and every speed is indicated on the " mix-finder " control dial. Attachments include a meat chopper and grinder, slicer and shredder, drink mixer, blender and

1. The Belling 107A and 108A drying cabinets are shown in company with a tasteful selection of electric fires. 2. " Servis " refrigerators and washing machines are displayed on Wilkins and Mitchell's stand. 3. The " C.90 " electric cooker is shown to full advantage on the stand of British National Electrics, Ltd.

Left: The new Hoover "Mark III" washing machine. Below: G.E.C. cooker fitted with the "Auto-Timer" automatic cooking device. Right: English Electric Model 4600 "tumblerdryer"

juice extractor. Electric food mixers are also being shown by the English Electric Co., Kenwood Electrics, Ltd., who include the "Kenwood Chef" as their chief exhibit, and Fraikad, Ltd. The latter company show the "Romix-Super" food mixer, fruit juice extractor, vegetable shredder and grater. Also to be seen on this stand is the "Rotel" steam iron attachment, a novel appliance for converting an ordinary electric iron into a steam iron.

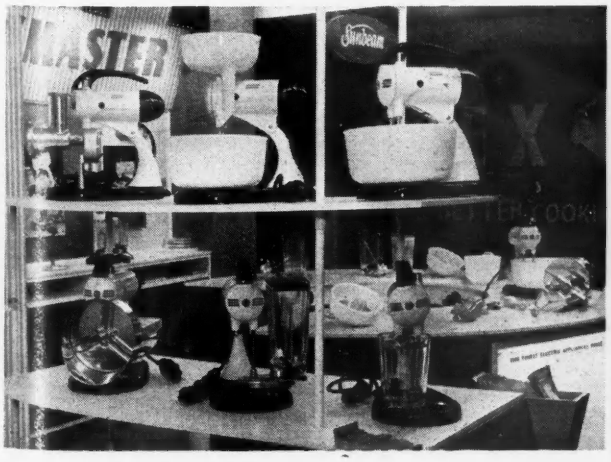
The growth of automatic cooking continues and a move towards a cheaper automatic cooker is made by the General Electric Co., Ltd., with the introduction of an automatic cooking unit. New cookers can be supplied with the unit fitted and wired ready for use or it may be purchased separately and fitted in place of the splash back in the case of the G.E.C. D.C.114 cookers. The unit incorporates an electrically operated oven-timer control, a spring-wound "minute" timer, and a strip lamp. A full range of G.E.C. appliances includes a new cabinet wash-boiler, small enough to "tuck away" yet with a capacity of 8 lb of dry clothes; a warming plate with a heat-resisting glass top; the DE.81 8 cu ft refrigerator, having a freezer locker capable of storing up to 40 lb of frozen foods; a new upright vacuum cleaner which weighs only 13 lb; and a floor polisher with automatic switching.

The chance to win a B.N.E. "C.90" electric cooker is offered by British National Electrics, Ltd., in a contest in which competitors have to decide the order of merit of the outstanding features of the company's cookers, convector heaters and water heaters from the point of view of efficiency and labour saving in the home. In addition to the "C.90" cooker, equipped with the "Speedheat" oven, which is claimed to heat up in half the normal time with no extra consumption of electricity, "Twin" water heaters, immersion heaters and a selection of fires are shown.

Among the many "Magicoal" electric fires on the Berry's Electric stand are models ranging from period grates to smaller patterns suited to a modern house or flat. No new fires have been recently added to the Belling range but their display is as attractive as ever and models of every kind are shown. Clothes drying cabinets, towel airers, bed warmers and many other electrical appliances for the home can be seen, in addition to the "Streamline" automatic cooker, with illuminated oven and inner glass door. The Jackson Electric Stove Co., Ltd., announces the Jackson "295" electric cooker as an addition to the "290" series; its extra high and wide oven will take a turkey weighing up to 30 lb. Automatic cooking is also possible with the "Cookalone" auto-control unit, available in cream or white, and fitted with tubular supports for fitting to the Jackson "190" and "290" series cookers.

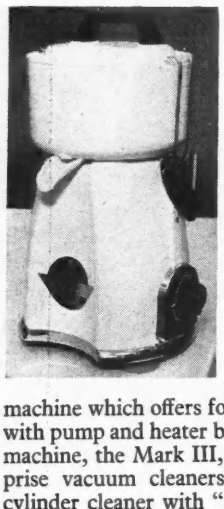
The first "tumbler dryer" to be made in Britain is featured by the English Electric Co., Ltd., in a range of home laundry equipment offering automatic washing,

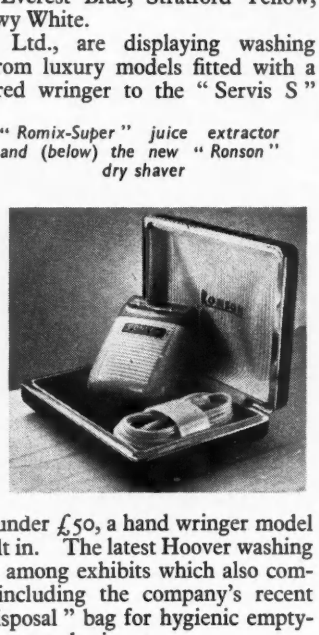
The Sunbeam "Mixmaster" food mixer is shown fitted with its various attachments including a meat chopper and grinder, juice extractor, slicer and shredder, blender, and drink mixer and (right) the "Goblin" range of vacuum cleaners, showing left to right: The G.53, G.52, G.38 (Regal) and G.51



wringing, drying and ironing. The dryer, which incorporates a 2·75 kW heater, requires no special installation and is operated by an automatic timer switch. The company's 8·3 cu ft refrigerator also shown, is now available in two colour combinations, white enamel with blue fittings and trimmings, and cream finish with turquoise. Another manufacturer favouring colour in its refrigerator range is Frigidaire whose 1955 models are styled in many colour finishes with such attractive names as Olympic Red, Sherwood Green, Everest Blue, Stratford Yellow, Cotswold Green and Snowy White.

Wilkins & Mitchell, Ltd., are displaying washing machines which range from luxury models fitted with a 3 kW heater and powered wringer to the "Servis S"

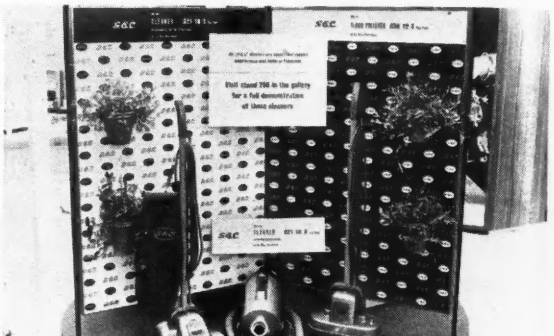




"Romix-Super" juice extractor and (below) the new "Ronson" dry shaver

machine which offers for under £50, a hand wringer model with pump and heater built in. The latest Hoover washing machine, the Mark III, is among exhibits which also comprise vacuum cleaners, including the company's recent cylinder cleaner with "disposal" bag for hygienic emptying, floor polishers, and steam or dry irons.

The whole of the "Goblin" range of cylinder vacuum cleaners has now been superseded by the introduction of three new models, G.51/52/53, and of these the most outstanding is the G.51, providing a high performance and yet almost silent in operation. The popular "Goblin Regal" upright bag model is retained.



The new G.E.C. vacuum cleaners and floor polisher

Among other items of interest is an attachment which converts a vacuum cleaner into a polisher, the "Turbo-Polisher," made by Electrolux, Ltd. It is suitable for polishing furniture and small household effects and should be a boon to car owners. Ronson Products, Ltd., a name long associated with cigarette lighters, introduce a new electric shaver which has a twin-coil power unit that has only one moving part. Dry shavers are also being shown by Philips Electrical, Ltd. ("Philishave") and Sunbeam Electric, Ltd. ("Shavemaster"). An automatic coffee maker with coffee service to match, exhibited by Elga Products, Ltd., combines the efficiency of a labour saving electrical appliance with the beauty of Staffordshire pottery. A redesigned electric paint scraper is shown by the Skarsten Mfg. Co., Ltd., and Thomas French & Sons, Ltd., have now entered the electricity field with their "Fleur-de-lis" electric blanket.

Rotary Amplifiers

A PAPER on the application of the rotary amplifier as a control-gear item was given on 2nd March before the London Students' Section of the Institution of Electrical Engineers by Mr. D. A. Alexander, who referred to it as only a more refined d.c. machine designed for high amplification, fast response to changing signals, accuracy, and usually capable of responding to the net effect of a number of signals.

Of the two basic control systems, voltage balance and magnetizing-force balance, the former was often preferred where greater accuracy was required; also it introduced no mutual inductance between the control and error-reference windings, which was harmful to the stability of the system. Different signals, however, could be more easily "mixed" with a magnetizing-force balance and reference and control circuits were isolated from one another. Limit circuits on a rotary amplifier might incorporate magnetic or electronic amplifiers to obtain a powerful cut-off signal when the bias voltage was overcome; if these amplifiers were in the main control circuits, the rotary amplifier was usually only the final link in a servo-mechanism chain, either as a generator or as a nearly linear amplifier exciting a machine field, in each case with a split-field error winding. A feed-back of rotary amplifier voltage or current gave a more linear characteristic and a means of adjusting its sensitivity, of minimizing the effects of hysteresis and of extra forcing.

The choice between rotary, magnetic and electronic amplifiers with an electrical servo-mechanism was conditioned by various factors. Very high accuracy (better than 1 per cent) and rapid response or utilizing low power signals normally required electronic devices. These were not so robust for industrial plants as static magnetic amplifiers and they tended to be more complex and with consequent difficulty in locating faults.

An important advantage of rotary amplifiers was their ability to regenerate, and also to reverse their output polarity without the push-pull circuits necessary for the other two types. There was usually little difference in cost between them, though rotary amplifiers became uneconomic at low powers; they were however capable of coping with heavy peak overloads. Efficiencies were higher with grid controlled power supplies than with Ward-Leonard control incorporating rotary amplifiers.

Birmingham Electric Railway Proposal

The Birmingham correspondent of *The Times* reports that a fast suburban electric railway for Birmingham—between the city centre and south-western boundary—would be quite feasible as an engineering project, according to preliminary investigations made at the request of the General Purposes Committee of the City Council. The Committee maintains that such a system would probably use several miles of central reservation from which tramways were only recently removed, and would relieve the city's complete dependence on diesel buses.

INDUSTRIAL NEWS

Electricians' Wage Increase

The National Federated Electrical Association announced last week that agreement had been reached between the Association and the Electrical Trades Union on an increase in the wage rates of operatives in the electrical contracting industry. As from 14th March wages of journeymen electricians would be increased by 3d an hour, with corresponding increases in the rates for all other classes of labour.

About 40,000 electricians are affected. The E.T.U. had asked for a substantial increase and in earlier negotiations the employers had offered an increase of 2d an hour. This was rejected by the union, the executive of which decided to take a ballot of its members in electrical contracting whether or not to strike in support of their claim. With the agreement this has become unnecessary.

The new inclusive hourly rates for journeymen electricians will be as follows:—Grade A area, 4s 5½d; Mersey District, 4s 1½d; and Grade B areas, 4s 0½d. For adult mates the hourly rates will be:—Bristol, 3s 4½d; London, 3s 8½d; Mersey District, 3s 3½d; all other areas of England, Wales and Northern Ireland, 3s 2¾d. There will be proportionate increases in the wages of apprentices and boys.

N.A.T.O. Contracts

Contracts have been received by three British electrical concerns for the development and production of military electronic equipment for supply to N.A.T.O. countries. The General Electric Co., Ltd., has received an order valued at nearly $10½ million, the British Thomson-Houston Co., Ltd., one valued at $11½ million and Ferranti, Ltd., an order valued at $4½ million.

The contracts have been negotiated with the Hazeltine Electronics Corporation, of New York, acting on behalf of the United States Navy Department.

St. Lawrence Power Project

A contract for the manufacture and supervision of erection of sixteen large water turbines—each rated at 75,000 h.p.—has, as already announced, been awarded by the Hydro-Electric Power Commission of Ontario to John Inglis Co., Ltd., of Toronto, the Canadian associates of the English Electric Co., Ltd.

The turbines will be built to the designs of the English Electric Co., but they will be made in Canada. The St. Lawrence power project involves a total of thirty-two sets, sixteen on the U.S. side of the international boundary and the other sixteen on the Canadian side.

The guaranteed efficiency of these 75,000 h.p. machines, when operating under a net head of 81ft is 92·5 per cent. The turbine runners will normally operate at 94·7 r.p.m. and have been designed to give a run-away speed of 200 r.p.m. which will facilitate considerably the task of designing the corresponding generators. The runner diameter will be 21ft and that of the shaft 39in. The spiral casings will be formed in concrete. The order is valued at more than $7½ million.

Management Training

Throughout industry and particularly in the larger and medium sized concerns more and more attention is being paid to the need for the planned development of the next generation of managers. Around Britain an increasing number of courses in management studies is being offered by universities, technical colleges, residential colleges and specialist institutions, while within companies there is a steady growth in the introduction of organized management training schemes.

The British Institute of Management, which has already completed a survey of the external facilities available, as part of its task in the field of education and training for management, is in process of compiling detailed and comprehensive information regarding the form and content of internal training schemes. In the meantime, it has published in "The Recruitment and Training of Men Intended for Management Positions" a report of a study group composed mainly of senior managers from nine leading concerns in a variety of industries on the recruitment and handling of management trainees. The group also included the secretary of a University Appointments Board and the director of the Public Schools Appointments Bureau.

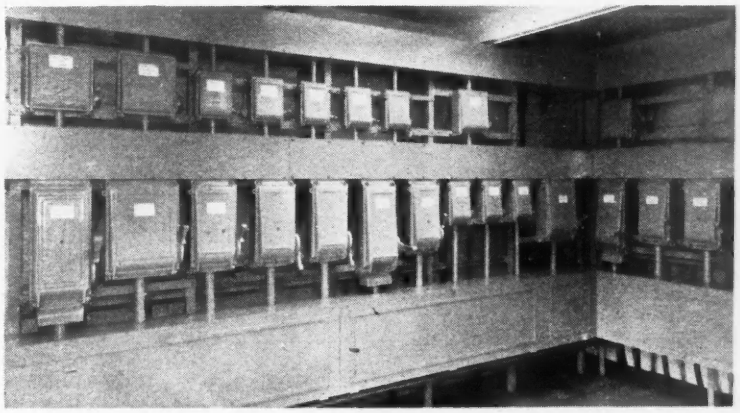
The report contains chapters on sources of recruitment, wastage among trainees, the budget of trainee requirements, methods of selection, induction and follow-up. Training arrangements are dealt with in some detail and financial arrangements including levels of remuneration are reported. A chapter is devoted to problem cases encountered after even the most careful selection and the booklet ends with a number of specific recommendations advanced by the Group. Copies are available from the Institute, Management House, 8, Hill Street, London, W.1, price 5s.

Switchgear at St. Pancras Hospital

A feature of the renovations recently carried out at St. Pancras Hospital, London, is the new electricity control room which is fitted with ironclad switchgear supplied by the General Electric Co., Ltd. This switch room is now the central distribution point for the whole hospital and replaces the four separate boards formerly used, each with its own supply. It is linked directly with the London Electricity's Board's main transformer and comprises a main breaker, six recording ammeters and switches for the different facilities in the fourteen blocks concerned. The new system forms part of a scheme now nearing completion in the course of which St. Pancras Hospital has been converted into a teaching hospital by the University College Hospital authorities.

The d.c. mains supply has now been changed over to a.c. This changeover and the installation of the new switchroom was accomplished without any break in supply. The

A corner of the new electricity control room at St. Pancras Hospital, showing some of the G.E.C. switchgear

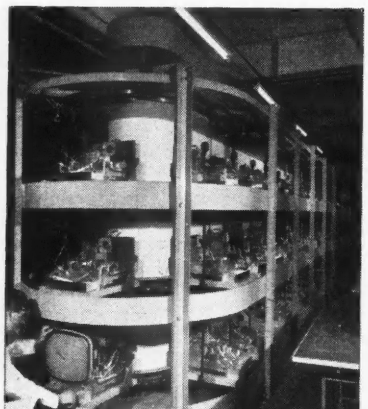


contractors were T. Clarke & Co., Ltd., and the work was carried out under the direction of the electrical engineer, University College Hospital.

"Soak Test" Conveyor

At the Romford factory of Regentone Radio & Television, Ltd., where large quantities of television and radio sets are produced each day, a new "soak test" conveyor has been installed to speed up the testing of television chassis before final assembly and despatch.

For the satisfactory testing of newly assembled television chassis, several



General view of conveyor in operation

hours of continuous operation are necessary to reveal any faults. Increasing production at the Regentone factory made the stationary testing of assembled chassis for this period a drag upon the production line and the conveyor has been introduced to speed up this part of the process.

The problem of supplying electricity to the individual chassis in motion has been overcome by the use of miniature current collection arms running along hard-drawn copper bars. Each bank of three television chassis is supplied via two of these miniature arms which are completely swivelling. The system was specially developed and installed by British Insulated Callender's Cables, Ltd., in co-operation with Regentone.

To minimize interference from sparking each miniature arm is fitted with a carbon insert slipper head. Multi-colour pilot lights are installed to give notice of faults and to indicate which part of the circuit needs attention.

North-Western Management Conference

The second North-Western Management Conference to be organized by the British Institute of Management (and the Blackburn, Manchester, Merseyside and Warrington Branches of the Institute of Industrial Administration) will take place at Southport on 18th and 19th March. The Merseyside and Manchester Branches of the National Union of Manufacturers will be associated with the conference, which will also have the support of the North-Western Regional Council of the Federation of British Industries. The theme of this year's conference is "Management and Modernization." Automation, the financing of re-equipment, and the human problems of modernization are among the subjects to be considered. Sir Charles Goodeve, director of the British Iron and Steel Research Association, will give the opening address, and Mr. Graham Hutton will speak at the closing dinner. The conference fee is £5 5s, which does not cover hotel accommodation or the closing dinner.

Further particulars can be obtained from the Institute, Management House, 8, Hill Street, London, W.1.

Electrical Commercial Travellers

Although the Electrical Trades' Commercial Travellers' Association has now been in existence for thirty years, its membership is smaller than it should be taking into consideration the number of electrical travellers in the country. This may be due, in part, to the fact that many representatives are unaware of the objects of the Association and the benefits which its members enjoy. To meet this, the Association has now issued a booklet, in which its objects are set out, and information given of its charitable work, and of its meetings and social activities. It is stressed that only bona fide male commercial travellers engaged in the electrical industry are eligible for membership and an application form is included. Copies of the booklet are obtainable from Mr. P. E. Pike, hon. general secretary, 18, Carew Road, Wallington, Surrey (telephone: Wallington 8937).

E.D.A. Public Speaking Competition

The final stages of the Yorkshire Area Competition were held at Whitehall Road, Leeds, on 14th and 15th February. In view of the large number of entrants, there being originally 18 competitors in the women's section and 22 in the men's section, it was necessary to hold eliminating rounds in January, when 11 candidates in each section were selected to compete in the final stages. Mr. A. Bond, the Board's deputy chairman, opened the proceedings, the first day of which was devoted to the women's section. In this section the judges were Mrs. Kathleen Chambers (Bradford), Mr. A. J. Coveney (area manager, A. Reyrolle & Co., Ltd.), Mr. E. Van Ham (the Board's chief accountant) and Mr. J. A. Stedman (E.D.A.'s education officer). The winner was Miss A. W. Milan (service centre assistant, No. 5 (Wakefield) Sub-Area) and the runner-up was Miss A. S. Raby (demonstrator, No. 4 (Leeds) Sub-Area). Both of these competitors spoke on "The Social Influence of Electricity."

In the men's section held on the second day, the judges were Mr. J. H. Taylor (deputy education officer, Leeds), Mr. A. J. Coveney, Mr. E. Van Ham and Mr. J. A. Stedman. The winner was Mr. F. R. Williams (clerk, Commercial Department, No. 6 (Hull) Sub-Area), who spoke on "Advertising." The runner-up was Mr. G. H. Payne (trainee sales representative, No. 7 (Grimsby) Sub-Area), who spoke on "Lighting and Living." The women's prizes were distributed by Alderman Mrs. Kathleen Chambers and the men's prizes by Mr. Bond.

Export Credits Guarantee Department

The Export Credits Guarantee Department has opened a new branch in Newcastle-upon-Tyne, to serve the areas of Tyneside, Wearside and Teesside. Pending completion of the new offices, the manager of the new branch, Mr. J. A. Bookless, will be operating from temporary premises at 93a, Grey Street, Newcastle-upon-Tyne, 1 (telephone: Newcastle 26011).

Batti-Wallahs' Society

There is little that can be done with the habitual criminal, but there are many whose offences are not entirely their own fault, and in selected cases these are sent to "open" prisons where they enjoy a certain amount of freedom and amenities denied to the more hardened types. Mr. N. H. Golding, who is governor of Grendon Hall, one of these "open" prisons, in an after-lunch address to the Batti-Wallahs' Society last week, told of the excellent work which is being done to rehabilitate men who have fallen by the wayside.

Mr. T. C. F. Bigland (the "Mate") reminded members of the ladies' night to be held at the Connaught Rooms on 16th March and mentioned that there were still a few tickets available. The next luncheon of the Society is on Wednesday, 30th March, when the speaker will be Mr. George Easton, the racing motorist.

Electricity Helps Highland Tourism

During recent years hotels, boarding houses and catering establishments throughout the north of Scotland had been quick to grasp the opportunities for modernizing their premises made possible by Scotland's new and abundant hydro-electric supplies from her own glens. To-day, in the north, they had hotels equally as well appointed and equipped, electrically, as any in the south. These claims were made by Sir Hugh Mackenzie, C.B.E., deputy chairman of the North of Scotland Hydro-Electric Board, in Aberdeen on 14th February, when he opened a display of electric catering equipment. Stating that since 1948 over 400 hotels and boarding houses

had installed electricity throughout the north of Scotland, Sir Hugh said that in districts to which electricity was brought for the first time statistics showed that the possible accommodation for tourists often doubled and in some instances went up fourfold. With this increase in accommodation went a corresponding increase in amenities provided by electricity. Bearing in mind the fact that tourism was now Scotland's fourth industry the importance of electrification could be appreciated.

With Sir Hugh Mackenzie at the opening ceremony was Mr. J. Walton, proprietor of the Regent Hotel, Oban, who, at the request of the Board has, during the last three years, kept records on specially metered electrical equipment which enables the Board to reach an accurate assessment of electricity consumption in this particular hotel. In 1954, for example, the average cost to Mr. Walton of each kWh was 1·23d. Mr. Walton found that he could prepare meals at an electricity cost of 0·568d per meal and hot beverages at a cost of 0·0573d each.

The exhibition, which ran from 14th to 18th February, was well attended. The Jackson Electric Stove Co., Ltd., helped the Board to sponsor the exhibition. Equipment was also displayed by the Hobart Manufacturing Co., Ltd., Prestcold Refrigeration and Stotts of Oldham.

I.E.S. Dinner-Dance

The annual dinner and dance of the Illuminating Engineering Society will be held on 20th April (6.45 for 7.15 p.m.) at the Café Royal, Regent Street, London, W.1.

Industrial Films

Technical & Scientific Films, Ltd., in association with the Film Producers' Guild, Ltd., of Upper St. Martin's Lane, London, W.C.2, gave a showing last week of some typical examples of the special films they are making for industrial organizations. One of these, for Ferranti, Ltd., showed the mass production of domestic meters to achieve not only greater economy but greater accuracy. The film showed how a former production line of 43 machines making the magnet frame had been replaced by only three special purpose machines. A second film, for Babcock & Wilcox, Ltd., was of the magazine type designed to show the production and recreational side of the firm's organization. This was the first of a series to be made quarterly for showing to employees and at cinemas in the vicinity of the works.

British Plastics Year Book

The 1955 edition of British Plastics Year Book (652 pp., Iliffe & Sons, Ltd., price 30s, postage 1s 4d) has been revised and extended. It is divided into nine sections, three of which are devoted to classified lists of manufacturers and suppliers of materials, finished products, and equipment.

Another section contains the world's largest list of trade and proprietary names connected with the plastics industry, and covers materials as well as finished products. A glossary of technical terms used in plastics is included in this section. Nearly 4,000 firms associated with plastics appear, by countries, in the names and addresses section. The "Who's Who" section lists names and positions of prominent people in the British plastics industry.

One of the most important features is the annual review of plastics patents. This section of 139 pages contains all relevant patents issued last year; they are collected, abstracted and arranged in subject groups—amino plastics; cellulose plastics; ethenoid resins; thermosetting ethenoids; phenolic plastics; polyesters; silicon resins; super-polyamides; and plastics machinery. Each group is abstracted by experts, and prefaces give a brief review of the year.

A further feature is a detailed list of new plastics companies registered during 1954.

"Materials Handling News"

A new quarterly, *Materials Handling News*, is being published by Associated Iliffe Press (Dorset House, Stamford Street, London, S.E.1) on 1st July. The object is to effectively cover the "fringe market," which is quite distinct from the regular large-scale users reached by *Mechanical Handling*, the parent journal.

Brief and factual editorials will be included and a pre-paid card keyed to editorial items and advertisements will enable readers to obtain further information. Each quarter 20,000 copies will be distributed free and under careful control among senior executives in firms known to be making less than the maximum use of labour-aiding equipment.

London Sapper Reunion

The third London Sapper Reunion will be held on 30th April (7 to 11 p.m.) at the Duke of York's headquarters, Chelsea, S.W.3. The entertainment will include music by the band of the Royal Engineers, Chatham. Tickets (3s 6d each) can be obtained from the hon. secretary, R.E.A. London Group, Room 31, Horse Guards, Whitehall, S.W.1, the R.E. Association, 43, Denison House, 296, Vauxhall Bridge Road, S.W.1, or Mr. C. G. Mathews, R.E. Benevolent Fund, 29, Thurloe Street, S.W.7.

Electrical Fatalities in Queensland

A report on electrical accidents in Queensland records that there were twelve cases of fatal shock last year. In three of these electric drills (either faulty or wrongly connected) were responsible and in three other cases the shock resulted from contact with fallen service wires. A swing supported on a thick copper wire looped over a bearer of a house became electrified when the wire wore through a t.r.s. cable, resulting in the deaths of a child and also of her father, who went to her assistance. In another case a housewife received a fatal shock from an adaptor which had become worn and had loose contacts; when withdrawing the plug with one hand and holding an earthed electric iron in the other the woman's fingers came in contact with the live pin.

Works Visit

About sixty associate members and graduates of the London Branch of the Institution of Heating and Ventilating Engineers recently visited the Slough works of the Rheostatic Co., Ltd. They included the branch chairman, Mr. A. G. Ludgater, and the branch secretary, Mr. H. Prole, and the visit was organized by Mr. S. W. Hutt. The manufacture of temperature control devices associated with automatic firing, space heating and air conditioning is carried out at these works, and the visitors were shown the machining and assembly of component parts. Following the tour of the works, the party was entertained to lunch in the works canteen.

Sir Charles Colston's Venture

It is reported that Sir Charles Colston has formed a new company, Charles Colston, Ltd., to manufacture domestic labour-saving appliances. Permission is being sought from the Capital Issues Committee to issue shares to the value of £500,000. A factory is being acquired in Co. Durham, and by the end of the year Sir Charles hopes the company will have four or five further factories, employing over 1,000. The company is seeking to acquire other light-engineering factories as going concerns. Sir Charles was formerly chairman and managing director of Hoover, Ltd., and recently resigned from the position of vice-chairman of the Independent Television Authority.

Indian Inquiry

A New Delhi firm of manufacturers' representatives desires to secure agencies for British makers of electrical equipment (not heavy machinery and plant). We shall be pleased to give the firm's name and address to any interested manufacturers.

New Type Radar for London Airport

What is claimed to be the only completely crystal-controlled airfield radar of its type in the world is soon to be installed at London Airport, to serve the Southern Air Traffic Control Centre. An early development model has already been in operational use there for some time past, providing continuous service during periods of bad weather, for, unlike radar operating in the centimetric wavebands, it is unaffected by such conditions.

Designed and manufactured by Marconi's Wireless Telegraph Co., Ltd., the Type S.232, as it is known, is a multi-purpose radar for use at both civil and military airports.

French Electronics Journal

The Société des Editions Radio, 9, rue Jacob, Paris, 6, has brought out the *Electronique Industrielle*, a new journal covering electronic methods and apparatus in industry. Among the contents of the first issue are articles on the "Class D" amplifier, transistors and magnetic amplifiers, details of new equipment and abstracts of articles, etc., in the world Press. It is published at two-month intervals, price 300 fr.

Proposed Leeds Subway

A member of the Leeds Corporation, Councillor B. Mather, has put forward in the *Yorkshire Evening Post* a plan for a railcar subway in Central Leeds to relieve surface traffic congestion. This would extend from the central bus station to Westgate, with stopping points at Vicar Lane, Headrow-Briggate, Woodhouse Lane, Headrow-Park Row, City Square and Wellington Street (Central Station). Single-deck railcars (necessarily electric) coupled in pairs would be used for the system. Councillor Mather puts the cost of his scheme at £8 million, including rolling stock, and suggested changes on the surface sections of the system. Of this he considers £3 million should be treated as having the effect of a road improvement and qualify for a Government grant.

M.E.B. Sales Staff Training

Manufacturers of domestic electric equipment are co-operating with the Midlands Electricity Board in its scheme for the training of recruits to its service centre and sales staff. These are in future to have a residential course, the first of which covers a period of eight weeks and is at present in progress on an experimental basis. This course supplements the Board's existing training programme, under which a wide variety of three-day refresher and familiarization courses are held at the service training centre at Aston Fields, near Bromsgrove, Worcs.

The residential courses are being held at Avoncroft College, near Bromsgrove, under the supervision of Mr. S. M. Ashe, who was recently appointed by the Board to deal with this aspect of training under the direction of the Board's education and training officer, Mr. A. G. F. Pallister. Arrangements have been made for a maximum of practical instruction. Lectures, illustrated by lantern slides and films, are supplemented by visits to Sub-Area and District Offices, the cable jointing school, a power station, grid and distribution substations and actual public demonstrations of domestic appliances. In addition a dummy service centre provides an appropriate setting in which trainees are given practical experience of "selling" to each other. A workshop is planned, so that trainees can dismantle appliances and assimilate constructional features at first hand and during the more theoretical part of their training conduct simple experiments in fundamental electrical science. There is also a demonstration room in which trainees will use all kinds of domestic appliances, including cookers, washing machines, water heaters and food mixers. Both men and women trainees prepare and cook meals for their own and their colleagues' consumption and do their own laundry.

Future salesmen and saleswomen of the Midlands Electricity Board in one of the demonstration rooms using laundry equipment

Commercial Television

At a Press conference held last week by the Independent Television Authority details were given of the area it is hoped to serve from the temporary transmitter being erected at Croydon. Good results are expected in an area radiating from 30 to 40 miles from Croydon in the north, west and east, but considerably less to the south due to the screening effect of the North Downs. Most viewers will have reasonable reception for 10-20 miles beyond this, but the quality will be very dependent on local variations. The temporary transmitter is expected to be replaced after about eighteen months by a permanent one, giving generally improved reception.

The radio industry expects that television sets made within the last four years will be readily convertible to receive the new transmissions; whether this will be possible on earlier sets will depend very much on individual design. The cost of convertors is expected to average £6-7. Most viewers will require additional aerials.

Calendar

The Parolle Electrical Plant Co., Ltd., has sent us a calendar (March, 1955, to February, 1956), which has two months on each sheet, surmounted by illustrations of scenes on the Roman Wall, painted by Henry Burdon Richardson.

Control of Stocks

A new publication, "Control of Stocks for Distribution," published by the British Institute of Management, describes in detail the practice of ten companies which took part in a study group organized by the Institute to exchange information on this subject. Particular care has been taken to indicate the basic characteristics of each of the companies concerned so that readers can make useful comparisons between their own methods of stock control and those of a similar company described in the report. The booklet is available from the Institute, Management House, 8, Hill Street, London, W.1, price 5s.

Trade Announcements

On 14th March **Jenolite, Ltd.**, is moving from Covent Garden to new premises at 13-17, Rathbone Street, London, W.1 (telephone: Museum 5411). For several years the company has had a number of departments operating at 13-15, Rathbone Street, but the rapid expansion of its activities led to the acquisition and conversion of No. 17.

Mr. P. F. Barnett has been appointed technical representative of the **Davis Sheet Metal Engineering Co., Ltd.**, for the London area.

J. Day & Co. (Derby Works), Ltd., have made the following revised sales arrangements:—Scotland: Mr. C. Woodhead, 45, Westbourne Gardens, Glasgow, W.2. Cumberland, Northumberland, Westmorland and Co. Durham: Mr. C. A. Smith, 14, Meeting House Lane, Ulverston, North Lancs. Yorkshire, Lancashire, Cheshire and North Wales: Mr. T. H. Fletcher, 27, Kingsfield Drive, Didsbury, Manchester, 20. South Wales, South-West England, Hampshire, Wiltshire and Gloucestershire: C. L. Owen, Ltd., 1-2, Castle Cottages, Longbrook Terrace, Exeter, and 18, Pritchard Street, Bristol, 2. Wholesale trade (London Area): Mr. Rowlinson.

The Birmingham office of **Bastian & Allen, Ltd.**, is now at 21, Steelhouse Lane, Birmingham, 4 (telephone: Central 6372). Mr. R. F. Burton, who is sales engineer for the Midland Counties, is operating from the new office.

Changes of Name

The Thornton & District Electric Co., Ltd., has changed its name to L. Wetherley Electrical Contractors, Ltd.

Teddington Controls, Ltd., has changed its title to Teddington Aircraft Controls, Ltd.

GENERATION AND DEVELOPMENT

Industrial and Commercial Tariff Variations

The Merseyside and North Wales Electricity Board announces that variations to four of its standard tariffs will be made after 1st April next. The effect will be to reduce the cost of electricity to certain industrial and commercial users. The reductions have been made possible by improvements in power station operation resulting in economy in coal used for generation purposes, which has enabled a reduction in the coal price adjustment. To the industrial and commercial users affected it will mean a saving of approximately £66,000 in the year commencing 1st April next.

Fulham Grit Complaint

Unsuspected mechanical defects in the grit arresting plant at Fulham generating station have been discovered by the British Electricity Authority, according to a statement made by the Ministry of Housing and Local Government to Fulham Borough Council. The Ministry says that the B.E.A. has been carrying out an intensive programme of remedial works, which should be completed by the coming summer. The Council had joined with London County Council in representations about the grit nuisance from the station.

£25,000 Change-over Completed

The first a.c. supply was brought to Hereford in 1934 by 66 kV line from Stourport. By the end of the last war, however, the centre of the city and most densely loaded area was still fed from a.c./d.c. convertors installed at the old city power station. Following the establishment of the Midlands Electricity Board the work of laying cables and building new substations for supplying a.c. to the central area was put in hand.

In 1950 there remained 230 d.c. consumers, mostly large commercial and industrial premises, and the work of changing these over, at a cost to the Board of some £25,000, was completed on 23rd February, when two ceremonies took place. At the former power station Mr. Walter S. Lewis, chairman of the Board, opened for the last time the switches controlling the d.c. conversion plant. He said that in addition to the change-over the Board was spending £60,000 a year on the reinforcement of the distribution system in the area to meet the rising demand. In the Board's Area as a whole there were still 17,000 d.c. consumers and the cost of changing them over to a.c. would be about £2 million, while further expenditure would be required to deal with two-phase supplies.

The second ceremony was at the printing works of the *Hereford Times*, the last premises in Hereford to be changed over. There the managing director started up the new a.c. drive to the printing presses. The conversion involved the rewiring of the premises and replacing of 50 motors.

Poles for Overhead Lines

The Dutch ship *Kaap St. Vincent* docked at Bridgwater on 22nd February with a cargo of over 1,000 Swedish red fir poles for use in the South Western Electricity Board's rural electrification programme in the Bristol and Taunton Sub-Areas.

This trial cargo of treated poles from Sweden was ordered by the South Western Board as part of its efforts to reduce the cost of rural development work by keeping down the purchasing, handling and storage costs of poles. A special trailer with winches conveys the poles direct from the quay at Bridgwater to the sites where they are needed.

Line Diversion

A conflict has arisen between Gateshead Corporation and the North Eastern Electricity Board regarding the removal and resiting of overhead line towers on a housing estate. Neither side is willing to bear the cost of the work, and the Ministry of Housing and Local Government is to be asked to decide the matter.

District Heating

The British Electricity Authority is considering the possibility of formulating a scheme to make a supply of steam and hot water available to institutions, business houses and factories in the Hammersmith area. Talks are at present going on between the B.E.A. and the borough engineer and surveyor.

Reinforcement in S.W. Scotland

A number of reinforcement schemes have recently been approved by the South West Scotland Electricity Board, the largest being in North-East Glasgow. New 132/33 kV transformers are to be installed at Port Dundas substation from which duplicate 33 kV feeders will be laid to substations at Springburn and Petershill Road, thus transferring this district from its present source of supply, Dalmarnock power station. The cost is estimated at £232,000.

For reinforcing the high voltage networks to the west and south of Paisley, the voltage in the Ferguslie district is to be raised from 6·6 to 33 kV and other adjustments made at a cost of £113,764.

The Board has approved the second stage of the change-over of the Beith network from 3·3 to 11 kV, requiring the re-siting and rebuilding of four substations. The estimated cost is about £15,000. Between Girvan and Pinwherry some eight miles of three-phase 33 kV overhead line is to be erected and this, with ancillary work, will cost over £30,000.

The Board has agreed to provide an alternative supply to Skelmorlie by means of an additional overhead line between the International Business Machine works substation, Spango Valley, and Skelmorlie at an estimated cost of £11,550.

Services in New Houses

A recommendation before Kidderminster Borough Council is that half of the houses erected on the new Habberley estate should have electric cooking and washing appliances and half gas appliances.

Power from Yugoslavia

The Economic Commission for Europe has issued a report containing proposals for the export of hydro-electric power from Yugoslavia to Italy, Austria and Western Germany. The project, estimated to cost over $400 million, includes the erection of four generating plants and the extension of the existing Perucica station. It is said that up to 5,000 million kWh a year would be exported if the plan was realized.

American Atomic Power Plans

The *Economist* publishes a report from New York of three American plans for the generation of electricity from atomic power. The Consolidated Edison Co. of New York City is asking the Atomic Energy Commission for a licence to construct a 100-200 MW reactor on the Hudson River, some 30 miles north of the city, at a probable cost of nearly $50 million. A 100 MW plant is being planned by the Detroit Edison Co. and the recently-formed Yankee Atomic Electric Co. proposes to build a "full-scale experimental plant" in New England with a possible capacity of 100 MW.

Electrical Prospects in Bahrain

A 4,000 kW power station being erected in Bahrain is expected to be in operation by the middle of this year and an opportunity will then be available for increased sales of domestic electrical equipment and accessories. At the moment there are 5,600 electricity users in Bahrain and during the next five years it is anticipated that an additional 11,000 will be connected. In that time some £150,000 is likely to be spent on basic materials for house wiring and a further £150,000 on appliances.

Council House Installations

Wisbech Borough Council is to spend £1,065 on the wiring of 48 houses on the Bassett's estate.

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets had a good deal of success in recovering their balance in the few days following the shock of the Chancellor's decision on a 1 per cent increase in Bank Rate. Declines in the prices of Government securities were more or less automatic, and industrial shares had perforce to fall back into line with the lower level of gilt-edged values. They also of course come under the influence of the deflationary action of dearer money on the economy as a whole, which is a main object of the Chancellor's exercise. At the beginning of this week a healthier tone became manifest. There was obviously a great deal of bargain-hunting in most of the markets.

Extent of the Damage

Day-to-day movements of security prices are too erratic, at the moment, to permit anything detailed in the way of comment on changes in the accompanying price lists. They give a general impression, however, of the extent of the damage as it emerged from the dust of the initial upheaval, and after the first effective rally. Substantial as many of the falls are, most of the quotations shown are nevertheless well above the worst. As in the previous week, many of the most vulnerable prices proved to be those which had been based more on future prospects than on existing dividends and earnings. Among the most resistant shares were those in the big electrical engineering groups, whose future is regarded with special confidence by reason of the great new plans for railway modernization and nuclear power development.

Share Yields

The fall in gilt-edged stock prices brought the yield on such stocks as 3½ per cent War Loan to a level above the 4¼ per cent mark. In the face of this, yields of anything much less than 5 per cent on industrial shares became uneasily tenable, except on exceptional grounds such as confident expectations of an early dividend increase; and even in such cases anticipation turned much more cautious. In the list of electrical equipment shares, quite a number of the most favoured issues have continued to offer returns on a par with, or even below, the gilt-edged standard. For the greater part, however, the tendency has been towards the establishment of a gap of at least 1 per cent between the two markets.

New Issues

One result of last month's market behaviour was the creation of rough conditions for new issue launchings. These have, of course, to be planned well in advance of the event, and the terms cannot be expected to cover contingencies anything so sudden and extreme as those presented by

Week's Price Changes

Company or Board	Nom. Value	Middle price 28th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
						£ s d		
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	88½xd		3	3	3 7 10	97	88⅞
Brit. Elec. 1974/77	100	87⅛	−1	3	3	3 8 7	96⅛	87⅛
Brit. Elec 1976/79	100	92⅛	−2	3⅛	3⅛	3 15 8	101⅛	93 3/16
Brit. Elec. 1974/79	100	102⅛		4¼	4¼	4 3 0	111⅛	103 1/16
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		6†	6†	5 14 3†	24/6	18/7
East African Power	£1	20/6	−1/-	7	7	6 16 6	23/4	19/6
Nigerian Elec.	£1	26/6		10	10	7 11 0	25/-	23/6
Palestine Elec. "A"	£1	22/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	18/6		6	10	10 16 3	20/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	12/-	−1/-	25	12½*	5 4 2	14/3	8/1
Aerialite	1/-	5/6	−6d	88⅛	88⅛	8 16 9*	14/6	10/9
Allen, W. H.	£1	79/6		15	20	5 0 8	78/6	50/-
Aron Elec. Ord.	£1	58/9	−2/6	20	15	5 2 3	60/-	43/-
Assoc. Elec. Ord.	£1	66/3	−3/9	20	11¼*	—	62/6	41/6
Automatic Tel. & El.	£1	72/6	−3/9	15	15	—	73/-	57/3
Babcock & Wilcox	£1	73/9	−3/9	18	12*	3 5 0	76/3	47/3
Baldwin, H. J.	2/-	4/6	−6d	20	20	8 17 9	5/6	3/9
Bakelite	10/-	30/-	−6d	12½	12½	4 3 3	32/-	23/6
British Aluminium	£1	37/-	−3/-	12	10	5 8 1	41/-	33/9
B.I. Callender's	£1	48/9		10	10	4 2 0	52/-	37/9
B.I. Callender's 6% Pref. ...	£1	23/9	−9d	6	6	5 1 0	26/6	24/3
British Thermostat	5/-	23/9	−2/6	35	27½*	—	28/-	12/-
British Vac. Cleaner	5/-	15/6	−1/3	15	25	8 1 3	14/6	11/6
Brook Motors	10/-	41/3	−9d	20	20*	—	45/6	29/3
Brush Ord.	5/-	8/3		4	6	3 12 9	8/3	3/6
Bulgin, A. F.	1/-	4/6	−6d	30	30	6 13 3	4/3	3/2
Burco	5/-	22/6		35	25*	5 11 0	21/6	12/1
Chloride El. Storage "A" ...	£1	60/6	−5/9	20	12½*	4 2 9	69/6	46/6
Clarke Chapman	£1	76/3	+4/3	20	20*	5 5 0	73/-	47/6
Cole, E. K.	5/-	19/3	−2/6	25	27½	3 11 6*	20/-	11/6
Cossor, A. C.	5/-	9/3	−1/-	10	10	5 8 0	11/-	7/-
Crabtree	10/-	32/-	−1/9	17½	20	6 5 0	32/-	23/9
Crompton Parkinson Ord. ...	5/-	17/6	−9d	20	20	—	17/9	11/6
De La Rue	5/-	20/9	−1/-	Nil	20	4 16 5	24/-	12/3
Decca	4/-	48/9	−8/9	35	56½*	4 12 3	56/6	32/-
Desoutter	5/-	26/3		20	25	4 15 3	26/6	16/1
Dewhurst	2/-	7/6	−6d	19	24	6 8 0	7/6	5/1
Dictograph Tel.	2/-	6/6	−9d	20	20	6 3 0	8/-	5/2
Dubilier Condenser	1/-	4/3	−6d	25	25	—	5/3	3/3
E.M.I.	10/-	28/9	−4/3	8	10	3 9 6	27/9	11/3
Electrical Components	5/-	15/9	−1/6	20	20	6 7 0	16/3	10/9
Elec. Construction	£1	32/6	−4/6	15	15	4 12 3*	35/-	26/6
Enfield Cable Ord.	£1	21/3	−1/3	5	Nil	Nil	26/3	16/6
English Electric	£1	65/-		10	12½	3 17 0	59/-	38/-
English Electric 3½% Pref. ...	£1	14/6	−1/-	3½	3½	5 3 6	16/9	15/3
Ericsson Tel.	5/-	31/-	−4/-	22†	25†	2 0 4*†	33/9	22/9
Ever Ready	5/-	23/9	−9d	35	40	—	26/3	17/9
Falk Stadelmann	£1	47/6	−2/6	15	15	6 6 3	49/-	36/6
G.E.C. Ord	£1	53/9	−1/3	11¼	12½	4 13 0	60/-	37/6
G.E.C. 6¼% Pref	£1	25/-	−1/3	6¼	6¼	5 4 0	28/9	26/6
General Cables	5/-	16/9		30	30	8 19 0	18/-	16/3
Greenwood & Batley	£1	55/-		17½	17½	6 7 3	55/-	40/3
Hackbridge Cable	5/-	14/-	−9d	20	20	7 2 10	15/9	11/3
Hackbridge & Hewittic	5/-	26/3	−9d	20	25	4 15 3	25/-	16/10
Hall Tel. Acc.	10/-	11/9	−3d	10	10	8 10 3	13/-	10/6
Heatrae	2/-	4/9	−3d	12½	12½	5 5 3	5/6	4/-
Henley's	10/-	19/-	−9d	10½	10½	5 10 6	22/-	15/6
Holophane...	5/-	18/3	−1/3	20	25	6 17 0	18/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

February's fall in the gilt-edged market. Issues appearing in these circumstances included Electric & Musical Industries' offer, to stockholders, of £2 million 4½ per cent unsecured loan stock at par, and of three million 5½ per cent second preference shares at 20s 6d. Early dealings in these were at discounts of, respectively, 2½ per cent and 2s. G.E.C.'s new 4 per cent loan stock, offered to stockholders at 97½, began at a discount of 5, which later contracted to 3.

in Electrical Investments

Company or Board	Nom. Value	Middle price 28th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	50/-	+2/6	45	70	7 0 0	51/-	26/3
I.C.I.	£1	40/6	−1/3	13	15	3 14 0*	43/6	26/6
Intl. Combustion	5/-	26/-	−1/6	20	25	4 11 0	30/-	14/6
Johnson & Phillips	£1	48/-	−3/-	15	15	6 5 0	52/6	45/6
Lancashire Dynamo	£1	60/-		12½	14	4 13 4	59/6	43/-
Laurence, Scott	5/-	15/-	−1/3	15	20	3 6 9	4/9	7/-
Lister, R. A.	£1	33/9	−2/6	12	9·3*	5 10 0	33/-	22/6
London Elec. Wire	£1	53/-	−4/6	15	10*	3 15 6	54/-	38/-
Lucas, J.	£1	43/9	−3/9	10·8	7½*	3 8 7	49/-	25/3
Marryat & Scott	2/-	9/6	−3d	22½	25	5 5 3	9/6	5/11
Mather & Platt	£1	59/-	+3d	15	13·4*	4 14 9	53/-	32/-
Metal Industries	£1	31/6	−2/6	12	9	5 14 3	42/3	29/6
Midland Elec. Mfg.	£1	43/9	−1/3	15	15	—	43/9	31/6
Morphy-Richards	4/-	26/3	−1/3	40	35*	5 6 9	27/6	11/4
Murex	£1	50/-	−2/-	15	15	6 0 0	57/-	49/-
Newman Ind.	2/-	3/3		10	10	6 3 0	2/6	2/-
Oldham & Son	1/-	3/-	−3d	17½	17½	5 16 9	3/4	2/5
Parnall (Yate)	5/-	9/-	−1/9	6	8	4 9 0	11/-	4/3
Parsons, C. A.	£1	57/6	−7/6	12½*	7½*	2 12 3	60/-	38/1
Plessey	10/-	62/6	−5/6	30	20*	3 4 0	64/-	37/10
Pye Deferred	5/-	28/9	−8/-	20	20*	3 9 0	37/-	15/7
Revo	10/-	13/6	−6d	27½	9*	6 13 3	20/3	14/-
Reyrolle	£1	92/6	−7/6	12½	13¾	2 19 6	92/6	66/-
Rheostatic	4/-	15/6	−9d	19	20	5 3 3	15/9	11/-
Richardsons Westgarth	5/-	13/3	−6d	15	15*	5 13 3	12/3	6/6
Scottish Cables	4/-	20/-	−1 3	20	27½	5 10 0	21/9	12/1
Smith (England), S.	4/-	15/9	−1/9	15	17½*	4 9 0	17/6	7/8
Southern Areas	£1	30⅝		6	7½	4 18 3	34/6	17/6
Strand Elec	5/-	8/9	−1/-	17½	17½	10 0 0	10/3	8/3
Sturtevant	5/-	23/9	−1/-	18·1†	18·9*†	—	22/9	14/6
Sun. Elec.	£1	33/9		15	15	8 17 9	33/9	27/6
Switchgear & Cowans	5/-	15/3		22½	10	3 6 8	13/7	9/9
Taylor Tunnicliff	5/-	12/9	−6d	25	12½*	4 18 0	12/4	10/7
T.C.C.	10/-	41/3	−2/6	20	30*	—	41/3	21/3
T.C. & M.	£1	35/9	−2/3	10	8½*	4 15 0	37/6	30/3
Telephone Mfg.	5/-	9/6	−6d	10	10	5 5 3	9/6	7/6
Thorn Elec.	5/-	28/9	−6/3	12½	20	3 9 6	30/6	13/3
Thornycroft	£1	35/-	−4/-	15	15	—	39/6	26/6
Tube Investments	£1	75/-	−5/-	15	17½	4 13 3	81/3	60/3
Vactric	5/-	32/6	−2/6	Nil	10	3 1 6	24/6	7/6
Veritys	5/-	7/6	−9d	10	12½	8 6 9	10/6	5/-
Walsall Conduits	4/-	52/6		70	70	5 6 8	52/6	44/-
Ward & Goldstone	5/-	37/6	−5/3	45	50	—	43/6	21/-
Watford	2/-	6/9	−3d	25	22½*	—	7/3	4/7
Westinghouse Brake	£1	93/9	−3/9	16	18	3 16 9	86/3	60/9
West, Allen	5/-	13/6	−1/6	15	17½	—	19/6	12/7
Wolf Electric	5/-	18/3	−6d	15	17½	4 16 0	17/6	11/-
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A Ord.	100	81	−1	6	6	7 8 3	89½	80
Ord.	100	52½		3½	3½	7 2 10	55½	52
Anglo-Portuguese	£1	21/6	−1/6	8	8	7 8 9	25/9	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	21/6		35	50	—	24/-	13/-
Cable & Wireless:								
Ord.	£1	42/6	+6d	9	10	4 14 1	42/9	26/2
4% Loan	100	93	−5½	4	4	4 6 0	98½	95½
Calcutta Trams	£1	20/6		2½†	6†	5 17 0†	24/6	17/1
Cape Elec. Trams	£1	17/-		5½	7	8 4 9	17/6	12/4
Marconi Marine	£1	34/6		10	10	5 18 6	35/-	27/6
Oriental Tel. Ord.	£1	97/-	−2/-	16	16	—	101/3	82/6
Telephone Props.	£1	82/6	−2/6	—	—	—	92/6	74/6
Telephone Rentals	5/-	9/6	−1/6	10	10	5 5 3	11/-	9/-

Desoutter Brothers

The fact that Desoutter Brothers 5s ordinary shares stood their ground, during the past week or two, ranks in the circumstances as the equivalent of a favourable market reaction to the final dividend and profits statement for the year ended last December. At 26s 3d the price of the shares still stands at about its highest mark. The yield works out at 4¾ per cent on the basis of the total dividend of 25 per cent, which is 5 per cent more than before. The earnings figures seem to provide another good illustration of benefits felt this year by previously heavy contributors to the excess profits levy. Although trading profits have expanded, the tax charge this time is smaller, so that the increase in the net surplus at £228,000 is of the order of 75 per cent. More than three-quarters of the profit is being retained in the business.

English Electric Capital

English Electric's full report includes a proposal for increasing the authorized capital, as a precautionary measure, by the creation of a further 10 million ordinary shares. No further new issue is at present contemplated. Acceptance of the company's share-exchange offer to stockholders of the Vulcan Foundry and Robert Stephenson companies would, however, leave English Electric with the number of unissued shares at under a million. This looks a small reserve in comparison with the scale of the group's operations, as revealed in the account given to stockholders, and with the magnitude of some of the undertakings in prospect. By the same comparison, the increase in the group's end-of-the-year overdraft to £9 million was not regarded in the market as being so large as to indicate necessarily the likelihood of an early issue of shares for cash.

Hoover's Good Results

Hoover's final dividend and preliminary profits statements more than satisfied expectations. These had been pitched high on the strength of evidence pointing to a big increase in sales of washing machines and vacuum cleaners. The result is seen in an expansion by nearly a half in Hoover's earnings, and a proportionately larger rise in the net surplus after tax (the company having been a heavy excess profits levy payer). Dividends are to be raised from 45 to 70 per cent on the ordinary shares, and from about 3s 9d to 6s per share on the "A" shares. The price of the £1 ordinary shares, which had been down previously to 42s 6d, rebounded after the announcements to 52s, relapsed almost immediately to 45s when the new hire-purchase restrictions were announced, and later picked up, on second thoughts, to 50s. Hoover "A" are 54s 6d.

REPORTS and DIVIDENDS

The English Electric Co., Ltd.—The report and accounts for 1954 now issued confirm the figures given in our last issue. In their report the directors state that during the year the company increased its investment in John Inglis Co., Ltd., by subscribing for a further 322,013 shares at $7·50 per share. An offer has been made to acquire the business of Vulcan Foundry, Ltd., and Robert Stephenson & Hawthorns, Ltd., by an exchange of shares on the basis of five English Electric ordinary shares of £1 each for every six Vulcan £1 ordinary stock units, and one English Electric ordinary share for every five Stephenson stock units of 5s not already held by Vulcan Foundry, Ltd. If this offer is accepted the English Electric Co. will allot 800,248 new ordinary shares to the Vulcan and Stephenson stockholders and, except for 947,715 ordinary shares, the whole of the share capital of the company will have been issued. It is therefore proposed to increase the authorized capital to £25,000,000 by the creation of a further 10 million ordinary shares of £1 each. No further issues are at present contemplated. The annual general meeting will be held on 17th March and will be followed by an extraordinary meeting to consider the resolution for the increase of capital.

With the report and accounts, the company has issued an illustrated booklet which enables shareholders and visitors to its works to obtain some visual impression of the results achieved during the past year, both at home and abroad.

R. A. Lister & Co., Ltd.—The annual meeting was held on 22nd February, Sir Percy Lister (chairman) presiding. In his circulated statement, Sir Percy said that during the year under review the turnover and profits, before taxation, had established yet another record. The increasing demand in the domestic market for the range of products of the group was encouraging and there were record demands from overseas which currently continued. The small air-cooled diesel engine recently placed upon the market was most successful and already the demand was considerably in excess of the current productive capacity which was being expanded as rapidly as circumstances would permit.

Hoover, Ltd.—The preliminary figures for 1954 show record group profits of £4,581,961, as compared with £3,095,793 for 1953. After meeting all charges, including taxation of £2,050,229, the net balance is £2,350,208 (against £1,321,294), of which £2,265,586 is attributed to Hoover, Ltd. It is proposed to pay a final ordinary dividend of 60 per cent (against 35 per cent), making 70 per cent for the year (45 per cent). The year's dividend on the £80,000 "A" ordinary is approximately 6s 0·58d (3s 8·7132d) per 1s share.

The General Electric Co., Ltd.—Underwriters of the issue to stockholders of £6 million 4 per cent unsecured loan stock, 1975-1980, at 97½ per cent have been called upon to take up 92·5 per cent of their participations.

Electric & Musical Industries, Ltd.—It is reported that underwriters of the offer to stockholders and noteholders of £2 million 4½ per cent unsecured loan stock, 1970-75, and 3 million 5½ per cent £1 cumulative second preference shares have been called upon to take up 89 per cent and 84¼ per cent respectively of their participations.

R. B. Pullin & Co., Ltd.—The annual meeting was held on 24th February, Mr. R. B. Pullin (chairman) presiding. In his circulated statement, the chairman said the growth and progress of the business had been well maintained during the year under review. At Brentford they had set up two new laboratories, one to cover the field of electro-medical apparatus and allied medical supplies and the other to cater for electronic development and engineering. Referring to the activities of the group, Mr. Pullin said that just after the end of the financial year they purchased the freehold of premises at Acton for Measuring Instruments (Pullin), Ltd., and now had a compact factory for the manufacture of all types of electrical measuring and testing instruments.

Alfred Herbert, Ltd., report trading profits for the year ended 31st October last of £2,815,424, as compared with £3,072,292 for 1952-53, but the net profit is higher at £1,482,796 (against £1,348,095). It is explained that the difference is mainly due to the reduction of E.P.L.—operative for only two months in the last financial year—from £350,000 to £50,000. It is proposed to pay a further dividend of 3½ per cent, making 6 per cent, tax free, for the year on trebled capital. No further dividend will be recommended for the year. The total distribution for the previous year on the old capital was 12½ per cent, tax free.

The Midland Electric Manufacturing Co., Ltd., reports that after taxation of £206,500, the net profit for 1954 is £203,392, as compared with £145,088 for 1953. It is proposed to pay a dividend for the year of 10 per cent on doubled capital (against 15 per cent).

Clarke, Chapman & Co., Ltd.—The net profit for 1954, after providing £231,362 for taxation, is £395,212, as compared with £275,763 for the preceding year. General reserve receives £100,000. It is proposed to pay a dividend of 20 per cent for the year (unchanged) on capital increased to £720,000 by way of a 50 per cent scrip issue.

Bruce Peebles & Co., Ltd., report that, after deducting £230,000 for taxation, the profit for 1954 is £231,852, as compared with £164,307 for 1953. To this is added £34,427 brought in and unrequired provision for taxation of £30,000, making £296,279. Reserves receive £157,792 and it is proposed to pay a participating dividend on the preference capital of 2½ per cent, making 10 per cent for the year (same) and an ordinary dividend of 15 per cent plus a bonus of 10 per cent, making 25 per cent. The ordinary distribution is the same as for 1953 but is paid on doubled capital.

Associated Electrical Industries, Ltd.—The preliminary statement for 1954 shows a trading profit of £14,759,000, as compared with £13,456,000 for 1953. The elimination of E.P.L., which cost £1,340,000 a year ago, has resulted in a sharp rise in the net distributable profit to £4,512,000 (against £2,933,000). It is proposed to pay a final ordinary dividend of 10 per cent, making 14 per cent for the year (against the equivalent of 11¼ per cent for 1953).

Waygood-Otis, Ltd., proposes to pay a final dividend of 35 per cent (against 25 per cent), making 75 per cent for the year (65 per cent).

Morphy-Richards, Ltd., have announced an interim dividend of 20 per cent (against 15 per cent a year ago on capital before the one-for-two bonus issue made in March, 1954).

The Electrolytic Zinc Co. of Australasia has declared an interim dividend on the ordinary and participating preference 5s units of 15 per cent (against 12½ per cent).

Lightfoot Refrigeration, Ltd., is paying an interim dividend of 3 per cent (unchanged).

International Combustion Africa, Ltd., has recommended payment of a final dividend of 25 per cent (against 20 per cent), making 40 per cent for the year (against 30 per cent).

Bankruptcies

I. MacT. Walker, carrying on business in partnership with another at 2, The Arcade, Swiss Cottage Station, Hampstead, London, N.W.6, radio and electrical retailers.—Order made 21st January, suspending discharge for six months until 21st July next.

J. W. Luker and **H. A. R. Phillips,** lately carrying on business in partnership at East Street, Lewes, and at 206, High Street, Lewes, Sussex, under the style of Gordon & Luker, electrical contractors. Separate application of J. W. Luker.—Application for discharge to be heard on 16th March at the Court House, Church Street, Brighton.

F. W. Bedingfield, 49, High Street, Folkestone, radio and electrical engineer.—Application for discharge to be heard on 8th March at the Sessions House, Longport, Canterbury.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 7th March

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "Short-Circuit Forces on Turbo-Alternator End Windings," by J. B. Young and D. H. Tompsett.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "Proving the Performance of Circuit-Breakers, with particular reference to those of Large Breaking Capacity," by J. Christie, H. Leyburn and J. F. Bird.

DUNDEE.—Mathers Hotel, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. Annual general meeting, followed by film.

GREAT MALVERN.—Winter Gardens Restaurant, 7.15 p.m. I.E.E. South Midland Centre, district meeting. "A Brushless Variable Speed Induction Motor," by Prof. F. C. Williams.

IPSWICH.—Crown and Anchor Hotel, 6.30 p.m. I.E.E. district meeting. "Research in the Electrical Manufacturing Industry," by L. J. Davies.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Power Factor Correction," by L. Brecknell.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "A Criterion of Distribution Cost," by D. J. Bolton.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers, informal meeting. Discussion on "What is the Future of the Steam Locomotive?" opened by C. M. Cock.

Caxton Hall, 7 p.m. E.P.E.A. London Technical Group. "Electricity in Large Buildings."

MAIDSTONE.—Wig & Gown Hotel, 7.30 p.m. I.E.E. district meeting. "Aluminium-Sheathed Cables," by P. M. Hollingsworth.

NEWCASTLE-UPON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio & Measurements Group. "Standard Frequency Transmissions," by Dr. L. Essen; "The Standard Frequency Monitor at the National Physical Laboratory," by J. McA. Steele; and "Standard Frequency Transmission Equipment at Rugby Radio Station," by H. B. Law.

Liberal Club, 98, Pilgrim Street, 6.30 p.m. North East Electrical Club. "Water Heating," by J. T. Sanders.

WORKSOP.—Technical College, Blyth Road, 7.15 p.m. Ministry of Works Lecture. "Small Heating and Ventilating Installations," by A. N. Robinson.

Tuesday, 8th March

ARBORFIELD.—R.E.M.E. Training Centre, 7 p.m. I.E.E. London Students' Section, district meeting. "The Development of Fluorescent Tube Control," by G. V. McNeill.

BELFAST.—Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. "Electricity in the Wool Textile Industry," by A. J. Francis and T. H. Carr.

BOURNEMOUTH.—Municipal College, Shelley Park, Boscombe, 7 p.m. Ministry of Works Lecture. "Powered Hand Tools," by A. F. Coare.

BRISTOL.—R.W.A. School of Architecture Library, 6.30 p.m. Institution of Heating and Ventilating Engineers, South Western Branch. Annual general meeting, followed by an illustrated paper.

CHELMSFORD.—Public Library Lecture Room, Duke Street, 7.30 p.m. Institute of Industrial Supervisors, Mid-Essex Section. Annual general meeting.

EDINBURGH.—11, Atholl Crescent, 7.30 p.m. Edinburgh Electrical Society. "Electrical Generation To-day," by G. A. Mears.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Students' Section. Students' Lecture: "Communication of Information—Human, Animal and Machine," by Dr. E. C. Cherry.

LONDON.—At the Institution of Electrical Engineers, Savoy Place, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "Some Non-Linear Magnetic Devices and their Application to Telecommunications," by J. W. McPherson.

85, Minories, 5.30 p.m. Institute of Marine Engineers. "Application of Modern Instrumentation and Distance Control of Machinery," by R. H. Paddon Row.

MANCHESTER.—Midland Hotel, 6.45 for 7.15 p.m. I.E.E. North-Western Centre. Annual dinner.

NEWCASTLE-UPON-TYNE.—At the Institute of Mining & Mechanical Engineers, Neville Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, North East Coast Branch. "Problems and Methods of Smoke Prevention," by T. F. Hurley and L. J. Flaws.

NEWPORT.—Flying Services Club, 28, High Street. Newport & District Electric Club. "Some Aspects of Power Transformer Engineering," by R. V. Darton.

NOTTINGHAM.—Gas Department, Demonstration Theatre, 6.30 p.m. I.E.E. East Midland Centre. Junior members' night.

STOKE-ON-TRENT.—M.E.B., 31, Kingsway, 6 p.m. I.E.S. Stoke-on-Trent Group. "Home Lighting," by Mrs. J. W. Stewart. (Joint meeting with the E.A.W.)

Wednesday, 9th March

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "Special Effects for Television Studio Productions," by A. M. Spooner and T. Worswick.

BIRMINGHAM.—Chamber of Commerce, New Street, 7.15 p.m. A.S.E.E. Birmingham Branch. "Oils and Greases."

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Recruitment and Training of Apprentices for the Engineering Industry," by S. R. Noble.

CROYDON.—I.E.E. London Students' Section. Visit to Croydon Sewage Works, at 3 p.m.

GLASGOW.—425/427, Sauchiehall Street, 7 p.m. Incorporated Plant Engineers, Glasgow Branch. Annual general meeting, followed by "Civil Engineering Problems and their Solutions," by D. Pentland.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. "Artificial Reverberation," by Dr. P. E. Axon, C. L. S. Gilford and D. E. L. Shorter.

At the Royal Institution, Albemarle Street, 6 p.m. Illuminating Engineering Society. Trotter-Paterson Memorial Lecture: "The Brightness of the Stars," by Sir Harold Spencer Jones.

NEWCASTLE-UPON-TYNE.—Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North-Eastern Section. "The Application of Negative Feedback to Electrical Measuring Instruments," by F. J. U. Ritson.

NORTHAMPTON.—College of Technology, 7.15 p.m. Northampton & District Electrical Association. Members' night.

NOTTINGHAM.—Adult Education Centre, Shakespeare Street, 7 p.m. Incorporated Plant Engineers, East Midlands Branch. Annual general meeting.

OXFORD.—37, George Street, 7 p.m. I.E.E. district meeting. "Some Aspects of the Design of v.h.f. Mobile Radio Systems," by E. P. Fairbairn.

PORTSMOUTH.—College of Technology, Anglesea Road, 6.30 p.m. I.E.E. Southern Centre. "The Manchester-Kirk o'Shotts Television Radio Relay System," by G. Dawson, L. L. Hall, K. G. Hodgson, R. A. Meers and J. H. H. Merriman.

SOUTHAMPTON.—Polygon Hotel, 8.15 p.m. A.S.E.E. Southampton Branch. Lecturettes.

WOLVERHAMPTON.—Wolverhampton & Staffordshire Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "Electrical Standards in Electronics," by P. M. Clifford.

YORK.—Picture House Café, Coney Street, 7.15 p.m. A.S.E.E. York Branch. "Electronic Control."

Thursday, 10th March

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. Association of Mining Electrical and Mechanical Engineers, South Wales Branch. "Industrial Economics," by W. P. Warren.

DERBY.—Electricity Showrooms, Irongate, 7 p.m. Derby Electrical Society. Ten-minute papers by junior members.

DUNDEE.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. "Special Effects for Television Studio Productions," by A. M. Spooner and T. Worswick.

GLASGOW.—39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Computing Circuits in Flight Simulators," by R. A. Marvin.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. Extra meeting. "The Electrical Equipment of the Toronto Subway Cars," by F. W. Roberts.

At the Institution of Civil Engineers, Great George Street, 5.30 p.m. Institute of Fuel. "Fuel Developments in Germany," by Dr. W. Gumz.

MANCHESTER.—North Western Electricity Board, Town Hall, 6 p.m. I.E.S. Manchester Centre. Members' night.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North-East Branch. Annual general meeting.

NORWICH.—Assembly House, 7.30 p.m. I.E.E. district meeting. "Fuel Supplies of the Future," by D. Hicks.

SWANSEA.—South Wales Electricity Board's Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "Some Design Features of a Semi-Outdoor Power Station at Ince," by F. H. S. Brown.

Friday, 11th March

BRISTOL.—Grand Spa Hotel, Clifton, 7 for 7.30 p.m. I.E.E. Western Centre. Annual dinner and dance.

LONDON.—Savoy Hotel, W.C.2, 7 for 7.30 p.m. British Refrigeration Association. Banquet.

Feathers Hotel, Broadway, Westminster, 6 for 6.30 p.m. Electrical Trades' Commercial Travellers' Association. General meeting preceded by a supper.

MANCHESTER.—Grand Hotel. Manchester Association of Engineers. Annual dinner and dance.

NEWCASTLE-UPON-TYNE.—County Hotel. Incorporated Plant Engineers, North-East Branch. Annual dinner and dance.

NOTTINGHAM.—Victoria Station Hotel. I.E.S. Nottingham Centre. Ladies' Evening.

STOKE-ON-TRENT.—Electricity Showrooms, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Possibilities of a Cross-Channel Power Link Between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

Saturday, 12th March

BRADFORD.—I.E.E. North Midland Students' Section. Visit to City Council Sewerage Works, Esholt, at 2.30 p.m.

LONDON.—I.E.E. London Students' Section. Visit to National Institute for Medical Research, Mill Hill, at 10 a.m.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 6th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1951

3197. Standard Telephones & Cables, Ltd.—Metallizing the surfaces of ceramic bodies. 1st February, 1952. (727462.)

15308. Minister of Supply.—Power units. 9th June, 1952. (727720.)

19518. Ferguson Radio Corporation, Ltd. —Valve amplifiers. 15th August, 1952. (727797.)

22310. Winston Electronics, Ltd.—Loud-speaking telephone systems. 5th August, 1952. (727656.)

24738. Londex, Ltd., and Besson, A. P.—Electric flashing devices. 21st October, 1952. (727722.)

25014. Metropolitan-Vickers Electrical Co., Ltd.—Thermal power plant. 23rd October, 1952. (727659.)

28455. National Research Development Corporation.—Electrical information-storing means. 3rd March, 1953. (727724.)

29233. Electric Transmission, Ltd.—Fusible electric cut-outs. 21st November, 1952. (727662.)

1952

4123. Metropolitan-Vickers Electrical Co., Ltd.—Flameproof switchgear. 14th May, 1953. (727664.)

4247. Schwarz, B.—Variable speed electric drives embodying a frequency convertor or frequency changer. 13th February, 1953. (727730.)

4541. Koehler Manufacturing Co.—Electronic circuits for regulating the potential of a power supply for an electric load. 20th February, 1952. (727583.)

5216. Electric & Musical Industries, Ltd. —Television. 27th February, 1953. (727480.)

5986. Westinghouse Brake & Signal Co., Ltd., Venning, C. F. D., and Hawkes, J. S.—Railway traffic control systems. 12th December, 1952. (727736.)

10219. Licentia Patent-Verwaltungs Ges. —Automatic telephone systems with main exchange and satellite exchanges. 23rd April, 1952. (727586.)

10497. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Electron-discharge tubes for storing electric signals. 25th April, 1952. (727739.)

11433. McCarthy, P. M.—Electric plug-and-socket couplings. 6th May, 1953. (727740.)

11504. Badische Anilin- & Soda-Fabrik. —Production of porous electrodes for accumulators. 7th May, 1952. (727807.)

11684. Metropolitan-Vickers Electrical Co., Ltd.—Power plant. 7th May, 1953. (727672.)

12338. Dowty Equipment, Ltd.—Press-button electric switches. 14th May, 1953. (727487.)

12356. Compagnie Générale de Télégraphie sans Fil.—Resonant cavity magnetrons. 15th May, 1952. (727742.)

15385. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Rotary electric switch. 18th June, 1952. (727746.)

16147. British Insulated Callender's Cables, Ltd.—Sealing glands. 25th June, 1953. (727677.)

16229. Western Electric Co., Inc.—Semiconductive materials and the production thereof. 27th June, 1952. (727678.)

16475. Soc. d'Electronique et d'Automatisme.—Electronic computers. 30th June, 1952. (727596.)

19912. Dubilier Condenser Co. (1925), Ltd.—Electrical suppressor capacitor arrangements. 20th July, 1953. (727496.)

19997. Wickman, Ltd.—Method and means for use in the working of metallic bodies by spark discharge electro-erosion. 22nd July, 1953. (727681.)

22255. Mallory & Co., Inc., P. R.—Controlling device for sequentially opening and closing electric circuits. 4th September, 1952. (727685.)

23335. Radio Corporation of America.—Radio frequency electric circuit arrangements. 17th September, 1952. (727500.)

25746. British Insulated Callender's Cables, Ltd.—Electric resistors. 13th October, 1953. (727505.)

26466. Vickers-Armstrongs, Ltd.—Electrical accumulators for registering digit valves. 23rd July, 1953. (727507.)

27076. British Tabulating Machine Co., Ltd.—Relay adding or subtracting circuits. 15th September, 1953. (727509.)

28749. National Research Development Corporation.—Radar reflector. 1st September, 1953. (727512.)

32203. Bosch Ges., R.—Electric motor control apparatus for multi-speed transmission gears. 19th December, 1952. (727757.)

32423. Siemens & General Electric Railway Signal Co., Ltd., and Field, R. W. G.—Electrical systems of remote supervision and/or control. 22nd December, 1952. (727613.)

1953

662. Hughes Aircraft Co.—Direct-viewing electronic storage tubes. 8th January, 1953. (727759.)

1015. Metropolitan-Vickers Electrical Co., Ltd.—Travelling-wave linear accelerators. 13th January, 1954. (727760.)

1106. English Electric Co., Ltd.—Dynamo-electric machines. 8th January, 1954. (727761.)

3181. Telefonaktiebolaget L. M. Ericsson.—Telephone exchange systems. 4th February, 1953. (727618.)

3402. Western Electric Co., Inc.—Microwave transducers. 6th February, 1953. (727838.)

3932. Mullin, J. T.—Method and apparatus for recording and reproducing television signals. 12th February, 1953. (727842.)

5265. Philips Electrical Industries, Ltd. —Circuits for use in automatic telephone systems. 25th February, 1953. (727526.)

7181. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Cathode-ray tube apparatus. 16th March, 1953. (727851.)

7235. Siemens & Halske Akt.-Ges.—Circuit arrangement for limiting testing time of selectors in telecommunication installations. 16th March, 1953. (727533.)

11589. Fairweather, H. G. C. (Olin Industries, Inc.).—Electric dry cells. 27th April, 1953. (727536.)

13665. Standard Telephones & Cables, Ltd.—Radar trainer. 3rd December, 1953. (727539.)

15461. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Metering arrangement in telecommunication system. 4th June, 1953. (727773.)

15736/7. Telefonaktiebolaget L. M. Ericsson.—Device for separating from a time modulated multi-channel pulse train a pulse train belonging to a desired channel and converting the latter pulse train into a duration modulated train. 19th December, 1950. (727776/7.)

16577. Mallory Metallurgical Products, Ltd.—Resistance welding apparatus. 16th June, 1953. (727862.)

17342. Westinghouse Electric International Co.—Systems for controlling the supply of current from an a.c. source to a load. 23rd June, 1953. (727779.)

22021. Warner Electric Brake & Clutch Co.—Apparatus for controlling the attractive force developed in an electromagnet. 30th August, 1953. (727783.)

23876. Vereinigte Aluminium-Werke Akt.-Ges.—Continuously formed electrodes for electric furnaces. 28th August, 1953. (727784.)

24079. Siemens & Halske Akt.-Ges.—Joints or terminal connections for high-frequency multi-layer conductors. 31st August, 1953. (727868.)

24680. Philips Electrical Industries, Ltd. —Circuits for generating currents of saw-tooth wave-form. 7th September, 1953. (727711.)

25147. Bagh, A.—Switchboard rack and panels. 11th September, 1953. (727549.)

25625. Singer Manufacturing Co.—Electrode mounting structure for radio-frequency seaming machines. 16th September, 1953. (727871.)

27066. Standard Telephones & Cables, Ltd.—Radio signal transmission systems. 2nd October, 1953. (727785.)

27426. General Electric Co.—Turbo-machine bucket-wheels. 6th October, 1953. (727716.)

28118. Westinghouse Electric International Co.—Systems for supplying electric power to an X-ray generator from a source of voltage. 13th October, 1953. (727553.)

28574. Labgear (Cambridge), Ltd., and Jones, L. W.—Electrically operated display devices. 15th April, 1954. (727554.)

35199. General Electric Co.—Thermostatic devices. 17th December, 1953. (727880.)

35494. Philips Electrical Industries, Ltd. —Magnetron circuit arrangements. 21st December, 1953. (727640.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 9th March:—

AGA. No. 715,859, Class 9. Scientific, nautical, surveying and electrical apparatus and instruments; radio and television apparatus; sound transmitting, recording and reproducing apparatus; optical apparatus and instruments, electric arc welding apparatus and electrodes; and parts and fittings.—Svenska Aktiebolaget Gasaccumulator, Lidingo, Sweden. Address for service, c/o Urquhart-Dykes & Lord, Maxwell House, 11, Arundel Street, Strand, London, W.C.2.

VCS ELECTRAVAC. No. 734,290, Class 9. Electric suction cleaners and parts and fittings. —Bylock Electric, Ltd., 109, South Street, Enfield, Middx.

SIMPLEX EMPEROR. No. 736,324, Class 9. Electric switches, fitted electric switchboards, cut-outs, fitted fuseboards and casings for electric fuses.—Simplex Electric Co., Ltd., Broadwell, Oldbury, nr. Birmingham.

TAM. No. 736,783, Class 9. Scientific apparatus and instruments; electrical apparatus and instruments; and radio, measuring and checking (supervision) apparatus and instruments.—Attwood Statistics, Ltd., Chantry House, Eccleston Street, London, S.W.1.

ADDEX. No. 737,187, Class 9. Radio and television aerials and aerial masts, and parts and fittings.—Antiference, Ltd., 67, Bryanston Street, London, W.1.

ULTRA-VITALUX. No. 721,294, Class 11. Electric lamp bulbs and parts and fittings.—Orram Gesellschaft mit Beschränkter Haftung Kommanditgesellschaft, Berlin and Munich, Germany. Address for service, c/o Cruickshank & Fairweather, 29, Southampton Buildings, Chancery Lane, London, W.C.2.

MURALUX. No. 734,940, Class 11. Lighting fittings and parts.—Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—15th March. Townsville Regional Electricity Board. 11 kV submarine cable, cables boxes and laying of cables in Cleveland Bay. (E.S.B. 3626/55. Ten/12660.)*

4th May. State Electricity Commission of Queensland. One engine driven generating plant, 150 or alternatively 190 kW, for Blackall Shire Council. (E.S.B. 3627/55. Ten/12679.)*

Bideford.—14th March. Borough Council. Street lighting equipment. (See this issue.)

Chadderton.—10th March. U.D.C. Electric lamps for one year. Surveyor, Town Hall.

Coventry.—8th April. City Corporation. Work in Woodlands Comprehensive Secondary School (second phase). (See this issue.)

East Suffolk.—10th March. County Council. Bulk supply of heavy canteen equipment, including refrigerators, food preparing machinery, etc. Chief education officer, Rope Walk, Ipswich.

Egypt.—30th March. Director General of Municipal Affairs, Kasr-el-Doubara Post Office, Cairo. Supply and erection of an electrical group of 600 h.p., Menouf station extension. (E.S.B. 3912/55. Ten/12720.)*

Ennerdale (Cumberland).—12th March. R.D.C. Electric wiring in 22 houses at Fletcher Street, Cleator Moor. Surveyor, Council Chambers, Cleator, Cumberland.

Fermanagh.—15th March. County Education Committee. Electrical installations in Kesh County Intermediate School. W. J. Ogle, 63, Main Street, Bangor, Co. Down.

Greece.—28th March. Ministry of Finance, State Procurement Service. Storage batteries. (E.S.B. 3806/55. Ten/12695.)*

India.—15th March. Executive Engineer, Hydel Generation Division, Lucknow. Turbo-alternator sets. (E.S.B. 3804/55. Ten/12678.)*

16th March. Director General of Supplies and Disposals, Government of India. Insulated copper and nichrome resistance wires. (E.S.B. 3750/55. Ten/12680.)*

Iraq.—26th March. Directorate-General of Municipalities, Bagdad. Insulated and bare cable, insulators, pearl globes, etc. (E.S.B. 3811/55. Ten/12684.)*

Midlothian.—18th March. County Council. Street lighting equipment. (See this issue.)

New Zealand.—30th March. Post and Telegraph Department, Wellington. 3,415 capacitors and 1,370 clamps. (E.S.B. 3421/55. Ten/12650.)*

Pakistan.—15th March. Department of Supply and Development. 33 kV switchgear, protective gear, control relay and metering board for outdoor substations. (E.S.B. 3734/55. Ten/12676.)*

Scunthorpe.—16th March. Borough Council. Street lighting equipment. (See this issue.)

South Africa.—16th March. Stores Department. South African Railways, Johannesburg. Cable end boxes. (E.S.B. 3156/55. Ten/12554.)* 24th March. Track section switches. (E.S.B. 4023/55. Ten/12736.)*

24th March. Union Tender and Supplies Board. Extensions to existing or supply of two new 6,600 V switchboards. (E.S.B. 3904/55. Ten/12709.)* Five 250 kVA, 6,600/380 V transformers. (E.S.B. 3903/55. Ten/12706.)*

Southern Rhodesia.—15th March. Salisbury Electricity Department. 33 kV and lower voltage cables and accessories. (E.S.B. 3962/55. Ten/12718.)*

15th March. Secretary, Electricity Supply Commission, Salisbury. 33 and 88 kV disconnecting switches. (E.S.B. 3727/55. Ten/12689.)*

Sunderland.—16th March. Town Council. Electrical installation at additions to Viliette Road School Clinic. Borough architect, Grange House, Stockton Road.

Syria.—17th March. Direction Général des P.T.T., Damascus. Automatic telephone apparatus and switchboards. (E.S.B. 3333/55. Ten/12629.)*

United States.—15th March. Cowlitz County No. 1 District Public Utility Office, Longview, Washington. Outdoor type transformers and step voltage regulators. (E.S.B. 3757/55. Ten/12697.)*

1st April. Corps of Engineers, U.S. Army, Seattle District, Washington. Three 103,300 kVA transformers. (E.S.B. 3798/55. Ten/12721.)*

Uruguay.—16th March. Administracion de Ferrocarriles del Estado. Dry cell batteries. (E.S.B. 3873/55. Ten/12692.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Ashton-under-Lyne.—Corporation. Lighting installation in Oldham Road and Cavendish Street.—Cohen Bros. (Electrical), Ltd.

Cockermouth (Cumberland). — U.D.C. Electric lighting in various streets (£3,644).—G.E.C.

Durham.—County Council. Electrical installation at former Durham Johnston School (£3,694).—North of England Engineering and Electrical Co.

R.D.C. Supply of electric fittings for housing scheme (£1,162).—"Z" Electric Co.

Frome.—U.D.C. Sodium lighting in various streets (£4,504).—Siemens.

Hazel Grove and Bramhall.—U.D.C. Mercury road lighting installation, Buxton Road and Macclesfield Road.—Cohen Bros. (Electrical).

Leicester.—Sheffield Regional Hospital Board. Recommended. Re-wiring of the Towers Hospital, Leicester (£1,322).—Midland Dynamo Co.

Scunthorpe.—Corporation. Electrical work in 57 flats at Beechway (£1,940).—B. Pumfrey.

Skegness.—U.D.C. Recommended. Street lighting for Roman Bank, between the Ship Hotel and the northern boundary of the urban district (£6,159).—East Midlands Electricity Board.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bath.—Bus station and depot, Manvers Street; Bristol Tramways & Carriage Co., Ltd., St. Augustine's Place, Bristol.

Batley.—Large extensions to premises (£500,000); Petmar Industries, Ltd., processed fibres, Greenhill Mills, Grange Road.

Bedford.—Houses (100), Putnoe estate; borough surveyor.

Birmingham.—Library at Edgbaston for the University; Verner O. Rees, architect, 61, Queen Caroline Street, London, W.6.

Boreham Wood.—School at Hillside Avenue (£47,754); county architect, County Offices, Hertford.

Chelmsford.—New administrative centre in Springfield Road (£25,000), for Essex River Board; Offices of the Board, Essex Rivers House, 129, Springfield Road.

Pathological laboratory (£35,000) for Chelmsford and Essex Hospital; Moore, Simpson & Cleverly, architects, 34, Bedford Row, London, W.C.1.

Chester-le-Street.—Houses (337), for R.D.C.; F. Bowman, architect, Estate Office, Birtley.

Cumberland.—Clinic and occupation centre at Wigton; J. H. Haughan, architect, Portland Square, Carlisle.

Dewsbury.—Compressor house and electrical equipment house at Dewsbury Gas Works for North Eastern Gas Board; Samuel Armitage & Sons, Ltd., Bradford Road.

Droitwich.—Houses (105), Ombersley estate; R.D.C. surveyor, Union Chambers.

Durham.—Crematorium (£45,000); city engineer.

East Suffolk.—Secondary modern schools at East Bergholt, Halesworth and Saxmundham; county architect, Ipswich.

Eccles.—Houses (146), Brookhouse estate; borough surveyor.

Epping.—Municipal works depot at Harlow New Town, comprising garages, workshops, offices, etc., for R.D.C.; A. W. R. Webb, surveyor, 209, High Street.

Gateshead.—Office block, Melbourne Street, for Howe Bros., printers; C. S. Errington, architect, 46, Grainger Street, Newcastle-on-Tyne.

Haltwhistle.—Masonic hall, Park Road; W. Stockdale, architect, 73, Howard Street, North Shields.

Hendon.—Flats (344), Spur Road estate; borough engineer.

Hexham.—Police station; county architect. County Hall, Newcastle-on-Tyne.

Hove.—R.C. church, Court Farm Road; D. Plaskett Marshall, architect, 59, Gordon Square, London, W.C.1

Huddersfield.—Secondary modern school, Deighton; borough architect.

Leeds.—Technological block at University; Lanchester & Lodge, architects, 10, Woburn Square, London, W.C.1.

Leicester.—Houses (578) at Mowmacre Hill estate, and 172 at Thurnby Lodge estate for T.C.; John Laing & Son, Ltd., Mill Hill, London, N.W.7.

Liverpool.—Large extensions at Huyton, for Horsemaster Machine Co., Ltd.; Wm. Tomkinson & Sons, Ltd., 7/31, Great Newton Street.

London.—Engineering block for Imperial College of Science and Technology; Norman & Dawbarn, architects, 5, Gower Street, London, W.C.1.

Manchester.—Dwellings (248), Outwood Road, Cheadle; city architect.

Mansfield.—Pithead baths at Rufford Colliery for N.C.B. (£94,856); R. J. Addison, Ltd., Market Street, Longton, Stoke-on-Trent.

Mansfield Woodhouse.—Rescue centre, Mansfield Woodhouse Colliery (£70,000); H. S. Barnett, architect to N.C.B., 18, Milton Street, Nottingham.

Market Harborough.—Council chambers proposed by R.D.C. (£6,000); council's architect.

Middlesbrough. — Police headquarters (£200,000); J. A. Kenyon, borough engineer.

Middlesbrough.—Additions to transport depot and offices (£10,000) and two primary schools; borough engineer.

Newcastle-on-Tyne. — Development of Prudhoe and Monkton Hospital (£1,250,000), and erection of new hospital near Whitehaven, Cumberland (£1,000,000); P. H. Knighton, chief architect, Newcastle Hospital Board, "Dunira," Osborne Road.

Outpatients' department (£150,000); Board of Governors, Royal Victoria Infirmary.

Northampton.—Factory, Dallington Fields industrial estate; Northampton Tile & Fireplace Co., Ltd., Shakespeare Road.

North Riding.—Second instalment of technical college at Redcar; D. W. Dickenson, County School architect, County Hall, Northallerton.

Secondary school at Pickering for the E.C.; Gollins, Melvin, Ward and Partners, architects, 15, Manchester Square, London, W.1.

Northumberland.—Additions to Whitley Bay police station (£26,000); county architect, County Hall, Newcastle-on-Tyne.

Nottingham.—Large extensions to the County Hall for Notts C.C.; E. Vincent Harris, architect, 19, West Eaton Place, Eaton Square, London, S.W.1.

Reading.—Dwellings (126), St. Michael's estate; borough architect.

Seaham (Durham).—New factory proposed by John Barran & Sons, Ltd., wholesale clothiers, Team Valley Trading Estate, Low Fell.

Sedgley.—Factory, Holloway Street; K. E. Millard & Co., Ltd., Wolverhampton Road, Oldbury.

Sheffield.—Multi-storey shops and offices, Market Place/Angel Street site; Yorkshire Insurance Co., Ltd., Market Place, Sheffield, 1.

Milk distribution depot, Barley Wood Road; Express Dairy (Northern), Ltd., Broadfield Road.

Six-storey blocks of flats and maisonnettes at Gleadless Valley estate; city architect.

Southend-on-Sea.—Factory; C. F. Marshall & Sons, Ltd., Essex Works.

Southport.—Crematorium in High Brows Covert, Scarisbrick (£64,300); borough architect, 93/105, Lord Street.

South Shields.—New factory at Mill Dam; G. M. Dryden, Ltd., glaziers, 27, Laygate.

Houses (134), Dickens Avenue and Jesmond Terrace, and adaptations, Whiteleas Hospital; borough engineer.

Stafford.—Works; Charles Clarke & Son, Ltd., Chapel Ash, Wolverhampton.

Stockton-on-Tees. — Municipal block (£225,000); borough architect.

Tynemouth.—Secondary technical school; borough surveyor.

Wallsend.—Infants' school; county architect, County Hall, Newcastle-on-Tyne.

West Bromwich.—New premises at Lyttleton Hall estate for Mills Scaffolding Co., Ltd.; A. J. Crump & Sons, Ltd., Aston Road, Dudley.

Whitby.—Houses (102), White Leys estate, for U.D.C.; C. D. Taylor, architect, 41, Baxtergate.

Wolverhampton.—Factory, Wombourn, for John Whitehouse & Sons, Ltd., Park Street South; W. H. Page, architect, 25, Tettenhall Road.

Worthing.—Secondary modern school for girls; borough education architect.

PUBLIC LIGHTING PLANS

In the City of London the problem of efficient street lighting is a complex one. The city engineer, Mr. F. J. Forty, O.B.E., considered that vertical, wall-mounted, fluorescent lanterns would be most suitable and the "City of London" lantern was devised and produced in conjunction with Siemens Electric Lamps & Supplies, Ltd. First

A Siemens "City of London" lantern being erected on a tubular steel column outside St. Paul's Underground Station

installed in King Street, near Guildhall, in May, 1953, these lanterns house three 5ft 80 W fluorescent tubes. Although primarily designed for vertical wall mounting, the lanterns may also be mounted on columns singly or in pairs, back to back, or in multi-numbers. In a further installation now being made on the route from Holborn Circus to Cornhill, involving some 83 "City" lanterns, 59 will be vertically mounted on building faces and the remainder will be erected on tubular-steel columns.

ABERDEEN City Council is recommended to approve a scheme, estimated to cost £3,000, for the installation of improved street lighting at Rosemount Viaduct, Mount Street and Rosemount Place.

BEXLEY Corporation has instructed the borough engineer to prepare a comprehensive scheme for the lighting of East Rochester Way.

Plans for new overhead lighting along the Lichfield road at Shelfield will be included in the next annual estimates of the BROWNHILLS U.D.C.

DONCASTER Town Council proposes to improve the street lighting during the next financial year at the estimated cost of £10,890.

The Ministry of Transport has approved a scheme, estimated to cost £2,974, for the lighting of Park Lane, Furlong Lane, Overend Road and Grammar School Lane, HALESOWEN.

MAIDENHEAD Corporation has approved a scheme, estimated to cost £29,000, for the improvement of lighting in the main traffic roads.

NEWBURN (Northumberland) U.D.C. is applying for permission to change the lighting of main roads in the area from gas to electricity. The cost will be £2,043 for Newburn; £2,767 for Lemington; and £2,599 for Westerhope.

NEWTON ABBOT U.D.C. is applying for sanction to borrow £2,100 for modern street lighting in Highweek Road and Ashburton Road.

NORTHAMPTON Highways and Cleansing Committee has recommended that application be made to the Ministry of Transport and Civil Aviation for consent to borrow £114,565 for the conversion of street lighting from gas to electricity. The expenditure, which is to be spread over a period of four or five years, includes £6,215 for the fourth stage (additional cost of fluorescent lighting); £24,200 for fluorescent lighting along a further 7½ miles of main roads; and £84,150 for tungsten lighting in district roads.

OLDBURY Town Council has approved schemes for improved lighting in the borough, estimated to cost £13,770. The schemes include the substitution of electricity for gas in a number of the main roads.

PLYMOUTH City Council is recommended to approve the preparation of a scheme for the relighting of the Pembroke Street area.

PRESTON Parish Council, near Stockton-on-Tees, intends to convert the street lighting from gas to electricity at a cost of £2,000.

RAMSGATE Town Council is to convert the lighting of 12 streets from gas to electricity at a cost of £12,370.

STAFFORD R.D.C. has under consideration a scheme for the provision of street lighting in 21 villages in the area.

STOCKTON-ON-TEES Corporation has received loan sanction for £12,280 for proposed electric street lighting in Durham Road.

SUTTON COLDFIELD Highways Committee has authorized the putting in hand as soon as possible of a scheme for the provision of sodium street lighting on trunk road A.38, at an estimated cost of £5,143.

WEST HAM Corporation has approved a scheme, estimated to cost £6,569, for improved street lighting with sodium lanterns on concrete columns for Little Ilford Lane, Browning Road, Gladstone Avenue and part of Church Road.

WHITLEY BAY Council is to include in its estimates plans for converting further street lamps from gas to electricity. Forty-five lamps are involved, and the cost of the work, after allowing for the salvage of certain steel columns not required, will be about £3,000.